Kantronics

MT1200(G)

Users Guide: **Introduction,**
Getting Started,
Modes of Operation,
Command Reference, and
Hardware Specifications

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REVISIONS

Revision	Date	Description
REV-	2006-12-29	Release version
REV-B	2007-03-06	Corrections, updates, additions
REV-C	2007-08-02	Corrections, updates, additions
REV-D	2008-02-05	Added UI digis, APRSMSG, and ARPSSYM, deleted TUP and POLL interface modes and associated commands
REV-E	2011-07-14	Update contact information, formatting

The MT1200 is a Kantronics hardware and software design incorporating the AX.25 Level 2 Version 2 Packet protocol as adopted by the American Radio Relay League. It is designed to be used as a GPS beacon from a mobile environment.

We have attempted to make this manual technically and typographically correct as of the date of the current printing. Production changes to the TNC may add errata or addendum sheets. We solicit your comments and/or suggested corrections, see our Contact Us page in this document.

The MT1200 is manufactured in the U.S.A.

Kantronics Warranty Registration

Please take the time to fill out the warranty registration form (or a copy of the form) and mail it to Kantronics, including a copy of your sales receipt, to register your purchase. Kantronics must receive warranty registration within 60 days of purchase of the Kantronics MT1200 to be valid. Both must be on file at Kantronics in order for you to receive warranty service. Refer to the warranty policy in this manual for further information. Warranty Registration form and copy of sales receipt may be e-mailed to sales@kantronics.com.

Mail form and sales receipt to:

KANTRONICS
14830 W. 117th St.
OLATHE, KS 66063

Warranty Registration

Last Name: _____

First Name: _____ Call Sign: _____

Mailing Address: _____

City: _____ Telephone: _____

State/Prov. _____ E-Mail: _____

Zip/Postal Code: _____

Country: _____

Product: MT1200(G) Serial #: _____

Date of Purchase: _____ Dealer: _____

Note: The serial number of the unit is displayed to the terminal in the sign-on message when the MT1200 is powered on.

IMPORTANT:

READ THIS PAGE BEFORE YOU INSTALL YOUR NEW KANTRONICS PRODUCT

This product contains SOFTWARE in FLASH memory and/or diskette and/or CD, which is protected by both United States copyright law and international treaty provisions.

If you install or use this product, you will be deemed to be bound by the terms of the SOFTWARE license shown below. If you do not wish to be bound by such license, return such product and all associated documentation unused to your supplier for refund of the amount you paid.

License Agreement

1. **License.** In consideration of payment of the License Fee, which is included in the price of the product, the Licensee (you) is granted by the Licensor (Kantronics Company, Inc. - Kantronics) a non-exclusive right to use the SOFTWARE and associated documentation. No ownership rights to the SOFTWARE or its Documentation are transferred from Kantronics to you.

2. **Term.** This License Agreement is effective until terminated. You may terminate this Agreement by destroying the PROM or diskette or CD and Documentation. You may not rent or lease the SOFTWARE, but you may transfer the SOFTWARE and accompanying written materials on a permanent basis provided you retain no copies and the recipient agrees to the terms of this Agreement. Kantronics may terminate this Agreement without notice if you violate any terms or conditions of the Agreement. In the event of termination of the Agreement, provisions relating to Kantronics' disclaimers of warranties, limitation of liability, remedies, or damages and Kantronics' proprietary rights shall survive.

3. **Object Code.** The SOFTWARE is delivered in object code only. You shall not reverse compile or otherwise reverse engineer the SOFTWARE.

4. **Limited Warranty.** This product is covered by the standard Kantronics Co., Inc. Limited Warranty, which is enclosed.

5. **General.** This License Agreement constitutes the complete Agreement between you and Kantronics.

The SOFTWARE and/or Documentation may not be exported or re-exported in violation of any export laws or regulations of the United States of America or any other applicable jurisdiction.

This Agreement shall be governed by and interpreted under the laws of the State of Kansas, United States of America.

Use, duplication, or disclosure by the Government of the United States is subject to restrictions as set forth in subparagraph (c)(1)(ii) of the Rights in Technical Data and Computer SOFTWARE clause of DFARS 252.227-7013.

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Contact Us with any questions concerning this Agreement or any other matter relating to Kantronics Company, Inc. products or business practices.

LIMITED WARRANTY

KANTRONICS CO., INC.
LIMITED WARRANTY
Effective January 1, 1997

To receive notice of future updates, new product information and prompt warranty service, please fill in the Kantronics Warranty Registration form **COMPLETELY** and return it along with a copy of proof of purchase (to establish purchase date) to us. See our Contact Us page in this manual. The Warranty Registration form and proof of purchase may be e-mailed to sales@kantronics.com.

NOTE: Return of the Warranty Registration form and proof of purchase is a pre-condition to warranty coverage.

1. **WARRANTY.** Kantronics Co., Inc. ("Kantronics") warrants to the first consumer purchaser ("you"), for the Applicable Warranty Period (as described below), that the Applicable Product (as described below) will be free from defects in material and workmanship.

2. **REMEDY.** Kantronics agrees that, for any Applicable Product found by Kantronics to be in violation of the warranty of Section 1 hereof within the Applicable Warranty Period, it will, at its option, repair or replace the defective Applicable Product at no charge to you, excluding in-bound shipping charges.

3. **EXCLUSIVE REMEDY.** Repair or replacement of the Applicable Product, as provided herein, is the sole remedy available to you against Kantronics, and in no event will Kantronics be responsible for any other liability or damages or for incidental, special, or consequential damages, regardless of whether purported liability is predicated upon negligence, strict tort, contract, or other products liability theory and whether or not Kantronics is warned about the possibility of such liability or damages. **SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.**

4. **DISCLAIMER.** This Limited Warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for Kantronics any other liability in connection with the sale of its products. KANTRONICS SPECIFICALLY DISCLAIMS THE IMPLIED WARRANTY OF MERCHANTABILITY AND IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE FOR ANY APPLICABLE PRODUCT. IF, HOWEVER, YOU ARE A CONSUMER WITHIN THE MEANING OF 15 U.S.C. 2301(3), THE ABOVE DISCLAIMER OF IMPLIED WARRANTIES IS EFFECTIVE ONLY FOR PERIODS OUTSIDE THE APPLICABLE WARRANTY PERIOD. **SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.**

5. **APPLICABLE PRODUCTS AND PERIODS.** Kantronics products are of two types - (1) hardware units and (2) firmware and software for operation of these units, whether incorporated into the units themselves or separate from the units as adjuncts or accessories to the units. Hardware units and the media containing firmware, software and documentation are sold to the consumer purchaser and become property of the purchaser. Firmware and software are licensed for use by the consumer purchaser in return for a fee included in the purchase price of the units and do not become the property of the consumer. (See separate License Agreement provided with these products). The products to which the warranty of Section 1 hereof applies (herein "Applicable Products") and the periods during which the warranty shall apply to such products (herein, "Applicable Warranty Period") are as follows:

   Applicable Products:

   UNITS:

   MT1200, MT1200G, KPC-3 Plus, KPC-9612 Plus, KAM XL

   Applicable Warranty Period: One (1) year from date of purchase.

   MEDIA:

   EPROMS or PROMS, CDs, manuals (however bound), specification and other supplemental pages or any other media on which firmware, software or documentation are supplied

   Applicable Warranty Period: Thirty (30) days from date of purchase.

6. **EXCLUSIONS.** This Limited Warranty does not apply to the cosmetic appearance of the Applicable Product; to broken or cracked cabinets; to any accessory not supplied by Kantronics which is used with the Applicable Product; to any product that has been subject to misuse abuse or overvoltage; to any product that has been modified by non-Kantronics personnel unless specifically authorized **in writing** by Kantronics; or to any product damaged or impaired by shipping (whether or not caused by poor packaging), neglect, accident, wiring not installed by Kantronics, improper parameter settings which are cleared by performing a hard reset, or use in violation of instructions furnished by Kantronics or of generally accepted industry practice. Kantronics does not warrant that the functions contained in any software will meet your requirements or achieve your intended results; or that operation of any software will be uninterrupted or error-free or without effect upon other software used with it. *Responsibility for the selection of the hardware and software program to achieve your intended results rests with you.*

7. **REMEDY PROCEDURE.** Should you need to make a warranty claim, first contact the dealer from whom you purchased the product. If the dealer is unable to assist you, contact us. Contact us prior to returning an Applicable Product to receive a Return Authorization Number. (As a practical matter, problems can often be solved

in such a manner without the product having to be returned to Kantronics for repair or replacement.)

Return of any Applicable Product for the enforcement of rights under this Limited Warranty shall be at your expense. Any product returned for warranty service, which Kantronics determines to be without defect or not covered by this Limited Warranty shall be subject to the minimum charge for labor and the product will be returned to you at your sole expense. Please note, no warranty service will be provided until Kantronics has been furnished with your Warranty Registration card and copy of proof of purchase establishing purchase date.

8. **NON-ASSIGNMENT.** This Limited Warranty is not assignable by you. Any attempt to assign or transfer any of the rights, duties, or obligations hereof is void.

9. OTHER RIGHTS. This Limited Warranty gives you specific legal rights and you may also have other rights, which vary from jurisdiction to jurisdiction.

Return/Repair Procedures

Important: Our repair statistics show that over 70 percent of the units returned for service do not, in fact, require any service. Therefore, we advise you to please double-check the following list of common, user-solvable, sources of difficulty before contacting Kantronics about returning your unit for service.

Check-List for Possible Problems

Should you encounter difficulty in getting your equipment to “talk” to your computer, please perform at least the following limited checks before calling or writing:

Carefully check your wiring connections to the RS232 port.

If you purchased third-party cables, double-check to be sure that they conform to the Kantronics’ wiring instructions in this manual.

Verify your terminal baud.

It may be useful to perform a “Hard Reset”. (See Hard Reset section.) If service or repairs still appear necessary after you have checked the items listed above, it may be wise to call, fax, e-mail or write Kantronics to determine if the problem can be solved without returning the unit.

Return Procedures

When calling, report the product name and ask for the Amateur Radio Service Department. Please have the following information available:

The unit name and serial number (the serial number is found on the bottom of the unit).

The firmware version number (the version number is displayed when you give the Version command).

If possible, you should have the unit and your computer available to perform troubleshooting operations when you call.

The Service Department telephone hours are 8:00 AM to 12 noon and 1 PM to 5:00 PM Central Time, Monday through Friday. If you call outside these hours, the phone may just ring, or you may receive a valid business hours message. If lines are busy, you may wish to (and it may be faster to) contact service by fax, or e-mail. Service e-mail is currently checked twice per day. Before contacting us, please take the time to list out your problem fully and carefully.

When writing, faxing, or e-mailing Kantronics, include a clear description of the problem, unit name, firmware version, computer type, computer software used and if possible a

list of current parameter values for your unit (as shown in a DISPLAY listing). Be sure to include a return fax number and/or e-mail address.

Returns to the factory for refund or exchange are strictly regulated. Any return for refund or exchange, must be approved by the service department.

Charges

Consult the limited warranty policy in this manual for the service provisions offered by Kantronics at no charge. This warranty is considered to be in force only when the customer has submitted his completed warranty registration within 60 days of purchase, and when the stipulations of the warranty have been met.

Violations of warranty clauses will automatically void the warranty and service or repairs will be charged to the owner.

Service outside the warranty period will be charged at the cost of parts, labor, and return shipping. Units returned for service without a Return Authorization number will be subject to a minimum charge of 1/2 hr labor plus shipping and handling.

Contact the Service Department to obtain a Return Authorization number. If payment has not been arranged, repaired units will be returned C.O.D.

These C.O.D. charges can be avoided by including your VISA or MasterCard number with your unit to be repaired. Shipping and repair may then be charged.

International Returns

This section applies to international returns only, not to domestic returns.

In case of unit problems, first contact the dealer from whom you purchased the product. If you must return a Kantronics product to us, please observe the steps outlined below. It will save you, the customer, and Kantronics unnecessary difficulties and expense.

- All returns must be shipped to the factory.
- All expenses of returning items to Kantronics must be paid by you, including any duty/entry fees, whether the return is for warranty or non-warranty repair.
- Usually, the best way to return items to us is by mail. However, if you wish to use one of the courier services such as DHL, UPS Expedited, Federal Express, etc., be sure to use **DOOR-TO-DOOR** service. If you use one of these services, a commercial invoice may be required. Please check with your carrier before shipping.
- Include in the description of the items on the paperwork (whether postal or courier) the words:

"U.S. GOODS RETURNED FOR REPAIR/REPLACEMENT"

An additional description of "Amateur radio peripheral equipment", or "Data communications equipment", would be helpful. It would also be helpful (but not required) to include the code number 9801.00.0000 which tells U.S. Customs agents that the package contains "U.S. goods returned without improvement/enhancement". However, if the words "U.S. goods returned for repair/replacement" are on the paperwork, the number is not really necessary.

- Provide a value for customs purposes. This is usually the value of the item(s) in their current condition. A $0 value is not acceptable for U.S. Customs.

- Inside the package, with the item(s), include:

  - a fax number and/or e-mail address (if available) in case we need to contact you
  - a correct and full address for return
  - method of payment to be used for any charges (if MasterCard or VISA, include expiration date)
  - a brief description of the problem
  - a reference to any conversations with the technical/sales staff about the problem
  - and the Return Authorization number assigned.

- For warranty repairs, we will pay the shipping charges to return the item(s) to you via air parcel post. If you wish return by courier service, include your account number. To be eligible for repair under warranty, we must have a record that you sent your Warranty Registration form and proof of purchase to Kantronics, and the item(s) must still be within the warranty period at the time the return is authorized.

- For non-warranty repairs, you must pay the return shipping charges.

Radio Frequency Interference Statement

Note 1: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

There is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced Radio/TV technician for help.

The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment. The user is also cautioned that any peripheral device installed with this equipment must be connected with a high-quality shielded cable to insure compliance with FCC limits.

Note 2: The shield of the cable, whether foil, braid, braid over foil, or double braid, must be properly terminated (connected) 360° to the connector. This is usually accomplished by the use of a metal or metalized plastic back shell, but may be implemented by direct contact, including soldering, with metal portion of connector. Experience has indicated that cable assemblies (with connectors) advertised as “shielded” are not necessarily terminated properly, if terminated at all. Check cable construction to be sure.

RFI Suppression

In moving to the world of digital communications via computers, a new dimension of RFI may be encountered. In spite of the equipment manufacturers' diligence, each new piece of electronic equipment will react differently in each separate environment. Every amateur station will have its own unique layout, equipment variation, and antenna installations. Experience has shown that these differences are related to the total RF environment, and may be causative factors in RFI induced problems. The suggestions given here may assist in resolving RFI problems:

- Use shielded cable for all connections between equipment. See note 2 above
- Make all interconnecting cables as short as practical
- A balance should be maintained between cable length and equipment proximity. At times simply routing interface cables away from the video monitor or other devices, will solve a "screen hash" or electrical noise problem
- Feed-lines to antennas should be kept away from equipment control lines and/or interconnecting cables. If it is necessary for such lines to cross each other, they should do so at 90° angles
- Ground leads should be as short as possible and go to an EARTH GROUND
- Interconnecting cables appearing to act as radiators or antennas should be looped through a toroid. Be certain toroids, if used, are designed for the frequency in use

Welcome

Thank you for your purchase of the Kantronics MT1200(G).

Please review this chapter before you install your unit.

Package Contents

Check to see that you have the items listed below (later you will see how these items are used in your system):

- MT1200 unit, or MT1200G unit and GPS antenna
- Kit of parts to use in assembling cabling
  - Male DSUB-9 connector for radio port
  - Metalized DSUB-9 back shell with hardware
  - 3 foot (0.91 m) piece of 5-conductor shielded cable to connect the MT1200 to your radio
  - dc power connector
- and, of course, this “User’s Guide” manual on a CD-ROM

NOTE: The plug for the Telemetry jack is an optional accessory, and is not included in the package. That plug (Kantronics part no. 030-4022) can be ordered separately from Kantronics, or from the manufacturer or reseller, with their part no. ASP05110 (RIA Connect).

IMPORTANT: Record the serial number of your MT1200 on the warranty card, and in a safe place for future reference. The unit serial number is displayed in the sign-on message that the MT1200 reports when it is powered on.

Additional Parts for Your Packet Radio Station

In addition to your MT1200 unit, you will need the following parts to set up your packet radio station:

- An FM transceiver
- A microphone (Mic) plug and/or mating accessory plug or external audio plug for your radio
- A computer (or other RS232 terminal device)

- A serial modem cable, used to connect the MT1200 to your computer
- A 12 V dc power supply or power adapter
- If Telemetry operation is desired, the optional connecting plug is needed

Overview of This “User’s Guide” Manual

This user’s guide provides documentation on the MT1200 and packet radio, including the following:

- What equipment you will need.
- Installing and configuring your MT1200.
- Getting started using your MT1200.
- Documentation for operation of your MT1200.
- A full “Command Reference” of all MT1200 commands.
- Details of MT1200 internal jumpers.
- Parts list, and other technical specifications.

Additional documentation and supporting material is available on the “Information and Program” CD that ships with the MT1200.

Uses of Your MT1200

The MT1200 is designed for use as a stand-alone device, once it has been configured appropriately, along with a transmitter or transceiver for sending GPS position reports, and/or I/O telemetry data reports.

It can also be used as a regular TNC for packet communication with other packet stations (with or without the GPS option).

This allows you to do the following:

- transmit GPS location data from a vehicle
- serve as a basic digipeater or APRS UI digipeater for other stations
- transmit reports of analog or digital inputs
- control external devices with transistor switched control lines
- use computers to carry on real-time digital conversations between stations
- send and receive files
- password protected remote configuration, from another packet station

Our Assumptions about You

We assume that you are familiar with the following or that you can get help on these topics if necessary:

- general familiarity with your radio equipment and its intended uses
- basic use of your computer and its operating system, including copying disks and files, working with directories, and identifying and using the serial (COM) ports on your computer
- starting, configuring, and using a terminal program in your computer
- basic electronics knowledge needed if you are going to build or upgrade hardware yourself, (e.g., making cables)
- some knowledge of operating a packet radio station

Comparing the MT1200 (and 1200G) to the KPC-3 Plus

The following will list some of the differences, and similarities, between the MT1200(G) and the venerable KPC-3 Plus.

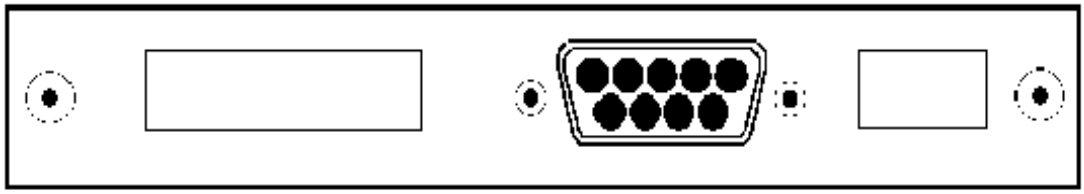
- The KPC-3 Plus has a separate 128K RAM chip inside, which can be replaced with a larger 512K (or smaller 32K) size, if desired. A battery backup maintains the memory contents.
- The MT1200 has only a limited amount of internal memory, and no battery backup. It does, however, remember changes to parameters automatically.
- The MT1200 and KPC-3 Plus can have a GPS device connected to either their serial port or an auxiliary input pin on the radio port.
- The MT1200G includes a GPS device inside.
- The KPC-3 Plus can accept data from GPS or weather station devices, the MT1200 can only accept GPS NMEA data.
- The MT1200(G) can transmit GPS data in compressed or MIC-E forms.

Installing Your MT1200(G)

The MT1200

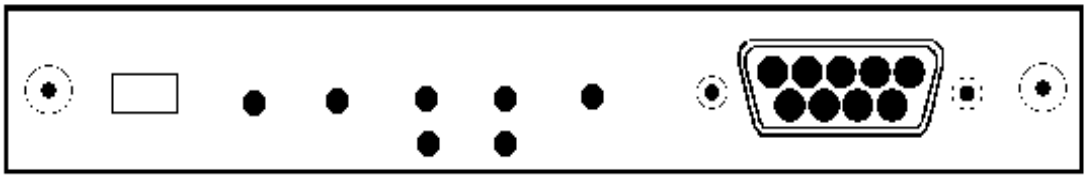
As shown below, the back of the unit has connectors to connect the MT1200 to your transceiver, a power source, a GPS antenna (on MT1200G only), and telemetry analog and digital inputs:

Back Panel



GPS ant **Telemetry Port** **Radio Port DSUB-9 female** **Power Jack**

Front Panel



Power Switch **PWR** **TX** **RX** **CON** **STA** **Serial I/O**

GPS STATUS **DSUB-9 female**

Note: All Kantronics' TNCs can operate without the computer being connected, once they have been configured. The MT1200 will beacon GPS position reports or can serve as a basic relay station for other stations without your computer being connected.

Connect Your MT1200 to a Power Source

Shown on the right side of the Back Panel, is the power connection to the MT1200. The supplied power plug will require a small flat blade screwdriver to attach the power supply wires.

- The MT1200 is designed to be powered from 12 V dc.
- This power can be supplied by 120-V ac to 12 V dc adapter, or use a 230-V ac 50-Hz to 12-V dc adapter if your mains are such.
- Or, use 12 V dc supplied in a vehicle.

Two connections are required, +12 V dc and ground, with an optional third wire for vehicle ignition sense.

Nominal current draw will vary, depending on whether or not a serial connection exists, and in the 1200G, whether or not the internal GPS is active. After initializing, but serial disconnected, current will be about 20 to 25 ma. Initialized, with (full) serial connected, current will be about 35 to 40 ma. Turning on the internal GPS, with serial connected, current will be about 65 to 75 ma. Internal GPS on, but serial not connected, current will be about 50 to 60 ma.

Looking at the rear panel of the MT1200, the outermost power jack pin is ground. The leftmost pin is +12 V, and the middle pin is the optional ignition sense. When connecting the ignition sense pin, connect it to a voltage source in the vehicle that is active (+12 V) when the ignition key is ON. The ignition sense line in the MT1200 will only draw negligible current (1 – 2 ma)

If you elect to install a fuse in the positive lead, do not use a fuse of greater than 200 - 250 mA.

When the ignition sense input has been connected to an appropriate connection in a vehicle (which has voltage when the vehicle ignition is on), the MT1200 will operate normally. When the power button on the front of the MT is in the off position, the MT will not be in operation.

If the power button is left on, but the vehicle ignition has been switched off, the MT is in a standby mode, and with minimum current draw and transmit beacons will stop. It will periodically turn on the GPS receiver to maintain location data. When the ignition is then turned on, the MT returns to operational mode.

Connect your MT1200 to Your Computer

The MT1200 and your computer communicate with each other via a serial communication cable connecting the MT1200' "Computer" port and a serial (COM) port on your computer.

The serial cable needed to connect your MT1200 to your computer (a standard off-the-shelf, RS232 modem cable) is not supplied with the MT1200. You will need to purchase one, or construct one.

Note: You may construct your own cable, using wiring instructions given below.

The two options, purchasing your cable or making it, are covered next.

Purchase Your Serial Cable

To purchase your cable (from your local amateur radio dealer or computer dealer):

- specify that you need a standard serial modem cable (RS232), with high quality shielding (see Note 2 in the Radio Frequency Interference Statement section), less than 3-m in length, and at least 5 wires connected.

- Specify that one connector be a male DSUB-9 connector (to connect to your MT1200' female "Computer" port) and the other connector be a female DSUB-9 or DSUB-25 connector (depending upon whether your computer's serial (COM) port has a male DSUB-9 or male DSUB-25 connector)

Making a Serial Cable

This section is for those making your own cable instead of purchasing one.

We assume that if you are making your own cable you are familiar with the process and just need to know: (1) what parts are needed, and (2) how the parts are connected.

Parts needed:

- a male DSUB-9 connector, to connect to the MT1200' "Computer" port,

- either a female DSUB-9 or a female DSUB-25 connector, depending on the connector on your computer's serial (COM) port, to connect to the computer's (male) serial (COM) port,

- an appropriate length (less than 25') of high quality shielded cable with 5 or more wires,

    - as shown below, if you are using a DSUB-9 connector, either 5 or 8 wires can be connected and any other wires are unused,

    - as shown below, if you are using a DSUB-25 connector, either 5 or 9 wires can be connected and any other wires are unused.

Note: You must terminate the shield on each end of the cable assembly properly. See Note 2 in the Radio Frequency Interference Statement section.

Wiring instructions:

Some third-party software does not use hardware flow control and therefore does not need the RTS and CTS wires shown below.

For details on preparing your cable wiring, use the chart below that is appropriate for your configuration. In each case, there is a listing of which MT1200 (“Computer” port) pin needs to be connected to which pin on the computer’s serial (COM) port. The wiring depends upon whether your computer has a 25-pin connector or a 9-pin connector, and on how many wires are in the cable (you only need 5 wires connected for MT1200 operations, but you may connect more wires to use the cable for other purposes).

CASE 1: Wiring if computer has a 9-pin connector:

MT1200		**Computer**	
2	<——>	2	TXD
3	<——>	3	RXD
5	<——>	5	Signal ground
7	<——>	7	RTS
8	<——>	8	CTS
1	<——>	1	DCD (optional)
4	<——>	4	DTR (optional)
6	<——>	6	DSR (optional)

CASE 2: Wiring if computer has a 25-pin connector:

MT1200		**Computer**	
2	<——>	3	TXD
3	<——>	2	RXD
5	<——>	7	Signal Ground
7	<——>	4	RTS
8	<——>	5	CTS
1	<——>	8	DCD (optional)
4	<——>	20	DTR (optional)

6 <——> 6 DSR (optional)

Technical note for advanced users: *Two of the first five wires in each chart above (RTS and CTS) are used for hardware flow control, so if your program uses just software flow control and not hardware flow control, you may not need to use these two hardware flow control wires.*

➔ If you are not using a PC compatible computer, the wiring required between your computer and your MT1200 is the same wiring you would use for a "Hayes" type external telephone modem. This cable should be available from your computer dealer. Appendix A of this manual includes details on the functions of the MT1200' pins. The software (terminal program) requirements are also the same as that used for a telephone modem.

Installing the RS232 Cable

Once you have purchased or made your serial communication cable, connect it as follows:

Step 1. Make sure that power to both your computer and your MT1200 is turned OFF.

Step 2. Plug the female DSUB-9 (or DSUB-25) connector end of the serial cable into a serial port on the computer.

Step 3. Plug the male DSUB-9 connector end of the serial cable into the serial port of your MT1200 (front panel).

Caution: Be sure you do **not** connect to a parallel port instead of a serial port. The MT1200 communicates serially, so it cannot communicate through a parallel port. Computer's parallel ports (i.e., printer, or LPT port) usually have female DSUB-25 connectors. Do not connect the MT1200 to a female DSUB-25 connector on the computer unless you are sure it is a serial (COM) port and is not a parallel (LPT) port.

Step 1. Check the connectors at each end of the cable, and secure the connectors using the mounting screws,

Step 2. Turn ON the power to your computer, in preparation for running or installing communication software in the computer, but leave the MT1200 power OFF.

To verify that your serial cable is correctly wired and connected, you need to run or install communication software in the computer and then use that software to establish communication with the MT1200.

Cabling an external GPS receiver to an MT1200

NOTE: This section applies to the MT1200 (without internal GPS). It does not apply to the MT1200G, which comes with a GPS receiver module installed inside.

The NMEA standard specifies that the signals in the GPS receiver data port follow the EIA-422 standard.

Technical note*: Many GPS vendors simply use "TTL" voltage levels (+5 V and 0 V), but use the same polarity as RS232. These units are capable of driving a Kantronics TNC RS232 serial data port input pin. However, some GPS vendors invert the sense of this signal (true TTL), and these units will not directly interface with a TNC.*

Warning: The Kantronics TNC serial ports are RS232; that is, they provide for signals that swing plus and minus approximately 8 V. Check your GPS manual before connecting this port to your GPS device to make sure that it is capable of handling these voltages. Kantronics is not responsible for damage wherein its TNCs are attached to other devices; see the Kantronics Limited Warranty.

To connect the data port of a GPS unit to your TNC, you'll need a two or three-wire cable. A shielded cable is preferred. Refer to your GPS manual to determine which pins are used for signal ground, data output to an RS232 device, and data input from an RS232 device (such as the TNC). At least two of these wires must be connected at both ends of the cable:

- connect the signal ground wire of the GPS data port to pin 5 of the DB9 serial port. This wire may be identified as "NMEA-" by some GPS vendors.
- connect the "data output pin" of the GPS data port to pin 3 of the DB9 serial port. The data output pin may be identified as "NMEA+" by some GPS vendors; this is the line that supplies the NMEA sentences to your TNC.

- Enable GPS input to the DB9 serial port by setting ABAUD in the MT1200 to match the baud of data output from your GPS receiver, then set INTFACE to GPS.

Some GPS units may allow for programming of parameters. If so, this is accomplished by passing commands to the GPS unit from a terminal (or TNC) via an additional pin in the data port.

If your GPS unit accepts the setting of parameters, you may wish to connect the third wire of your cable from the input data pin of the GPS data port to pin 2 of the DB9 serial port. Again, consult your GPS manual for the name of this pin; names vary by vendor. Also, make sure this pin will accept an RS232 signal (+ and – voltages).

Alternate GPS Input

In the MT1200 (which does not come with an internal GPS), an alternate input for GPS data is available. This input is pin 2 on the MT1200 "Radio" port, and is enabled with the

command GPSPORT. A data signal ground is also required, which is pin 6 or pin 9 on the “Radio” port.

Note: The default function for pin 2 on the radio port is XCD (external carrier detect). If pin 2 has been connected to a GPS device, and GPSPORT has been configured for GPS input on this pin, the XCD function is not available.

Configure Your MT1200

After connecting your MT1200 and your computer with an RS232 serial modem cable, you are ready to:

- install and start terminal software in your computer to enable communication between your MT1200 and your computer,
- use the terminal communication software to establish communication with your MT1200, including setting the speed of communications back and forth, and
- configure your MT1200 to prepare it for your use, including giving the MT1200 your CALLSIGN and making any needed changes to the MT1200 parameter values.

HyperTerminal

To communicate with the MT1200, all you need is a basic terminal communication program.

Windows systems (from Win95 up to WinXP) include one called HyperTerminal. There are several other terminal programs, which can be used on Windows computers or in other operating systems. Following the instructions for HyperTerminal will give you the basics for setting up other terminal programs.

To start HyperTerminal in Windows, click Start, Programs, Accessories, then Communications menus. HyperTerminal should be one of the possible selections. If it is not, it may not have been installed when Windows was installed. You will then have to use the Add Program, Add Windows Component from the Control Panel to install it.

Click HyperTerminal from the Accessories menu. HyperTerminal will open with a window asking for a name for a new connection. Enter “MT1200 9600”. Pick a different icon if you want, then click OK.

A “Connect To” window will now open. Use the drop down menu under “Connect using:” to select COM1. Then click OK.

A “COM1 Properties” window will now appear. Select 9600 bits/s, 8 data bits, no parity, 1 stop bit, and hardware flow control. Click OK.

You should now be at the main HyperTerminal screen. Click “File”, then “Properties”. In the Properties window, select Settings. “Terminal keys” and “CTRL+H” should already be selected. Use the drop down menu under “Emulation:” to select “TTY”. “Terminal Setup” will allow you to change your cursor; “Use destructive backspace” should be checked. Under “ASCII Setup” the defaults are sufficient (delays of 0 and only “wrap lines” checked). Click OK to close the Property windows.

You should now be back at the main HyperTerminal screen. Click File, then Save. The next time you click Start, Programs, Accessories, Communications, you will see that there is a HyperTerminal menu with a selection for “MT1200 9600.ht”. Clicking this will get you immediately to the main HyperTerminal screen already set up for the MT1200.

Later you may wish to change the baud or com port you are using with the MT1200. Before you can do that in HyperTerminal, you will first have to tell HyperTerminal to “disconnect”; there is a button on the HyperTerminal screen to do that, looking like a phone being hung up. Once disconnected, you can use the Properties menu to change the HyperTerminal configuration.

Now turn on the MT1200.

AUTOBAUD

The first time your MT1200 is used, it runs an AUTOBAUD routine to assure that the MT1200 baud is matched to the baud rate of whatever communication software you are using.

The MT1200’ AUTOBAUD routine works as follows:

Step 1. AUTOBAUD sends and resends the message “PRESS (*) TO SET BAUD” at one baud after another. When the MT1200’ baud matches that of your terminal program, you can read this on your screen; if the two rates do not match, the message appears garbled, if it appears at all.

Step 2. Any time while this message is being sent, whether it is readable or garbled on your screen, enter the “*” character (SHIFT+8 key combination).

Step 3. When the AUTOBAUD routine receives, the “*” character from the serial port, it uses that character to determine the baud in use.

Step 4. AUTOBAUD then sets the MT1200’ baud (ABAUD) to match the baud used.

Technical note: *The MT1200’ Baud is stored in the MT1200 as the value of the ABAUD parameter, so when you use the MT1200 later, it will start with that baud. The MT1200 does not have a memory backup battery, but simply stores changes made to parameter values.*

Step 5. Finally, AUTOBAUD sends a “sign-on” message and asks for the user’s CALLSIGN, which will also be stored in the MT1200 and used until changed. At this point, the user is ready to give commands to the MT1200.

➔ **Hint:** Do not confuse the MT1200’ baud for serial communication on the ***computer*** port with the MT1200’ 1200-baud for communicating using the ***radio*** port, which is connected by a custom-wired cabling to a transceiver.

Setting Basic Communication Parameters

There are several MT1200 settings in addition to ABAUD (baud) and MYCALL (CALLSIGN) that you may wish to change, especially if parameter values in your MT1200 have been changed from their default settings or if its responses are not displayed clearly on the screen.

The following TNC parameters are generally used with their default settings when running HyperTerminal, but you may wish to change them. If they have been set to non-default values, you may wish to change them back.

- AUTOLF = ON (default)
- ECHO = ON (default)
- FLOW = ON (default)

  Technical note: *Usually, ECHO and FLOW go together, both ON or both OFF. When using software that supports split screen displays, for example, set both ECHO and FLOW to OFF.*

- XFLOW = ON (default)

  Technical note: *XFLOW controls whether or not software flow control is ON. If XFLOW is set to OFF, the following parameters should also be set to 0 (zero): XON, XOFF, START, and STOP.*

- FILTER = OFF (default)
- 8BITCONV = ON (default)

➔ **Hint:** Also, the **MONITOR** parameter may be ON or OFF (default = ON). You may have Monitor ON while using HyperTerminal. But to prevent a build-up of data in an internal buffer in the TNC, you should turn Monitor OFF before exiting HyperTerminal **and** leaving the TNC ON. This is because when the TNC's receive buffer is full, your station will return a **BUSY** message in response to connect requests from other stations.

Documentation Conventions

The following conventions are used in the MT1200 documentation:

To indicate a particular key, the name of the key is given in capitals. For example, press the ENTER key.

Sometimes you need to hold down one key on the computer while pressing another key. This is indicated by giving the name of the first key, then a plus '+', then the name of the second key. For example, "Ctrl+C" means "press the key labeled 'CTRL' or 'Ctrl' (i.e., the "control" key) and, while continuing to hold it down, press the 'C' key". Multiple-key combinations that generate a single character are shown in angle brackets, like this: <Ctrl+C>.

Conventions for the MT1200 commands are covered in the "Command Reference" section of this manual.

Trouble-Shooting Difficulties in Communicating

If you are having difficulty establishing and maintaining communication between HyperTerminal and your TNC, here are some points to consider.

Problem: Go to Terminal Screen, but Nothing Happens

One possibility is that the current computer COM port is connected to a device, but that device is not your TNC. It might be a mouse or an internal phone modem, for example. To see if it is a mouse, go to the TERMINAL Screen, start moving your mouse and see if sequences of random or garbled characters appear as you move the mouse. If so, change the COM port setting in HyperTerminal and try again.

Another possibility is that the MT1200 has already been programmed with a different baud than the one set in the terminal program. You can try changing the baud in the terminal program, or you can use the self-test jumper (J11) to erase the current settings in the MT1200, forcing the MT1200 to try its Autobaud routine.

Problem: You Are Getting Bad or Intermittent Data

Many PC compatible computers are designed with a built-in potential conflict that may cause a problem. Both COM2 and COM4 (and both COM1 and COM3) may use the same interrupt (IRQ) mechanism to get the attention of the computer. This means that if devices on both COM2 and COM4 (or both COM1 and COM3) are sending signals to the computer at the same time, this can cause problems for programs, such as HyperTerminal, that use either COM port. If you are getting bad data, check to see if you have another device that might be getting confused with your TNC (on COM4 if your TNC is on COM2; COM3 if your TNC is on COM1) and make it inactive or remove it while using HyperTerminal with your TNC.

Problem: Your TNC Stops Behaving Normally

HyperTerminal is intended for use with a TNC in TERMINAL Interface Mode (or, less often, in BBS or GPS Interface Mode), but it may receive data from the TNC in any Interface Mode. Non-response, garbled data, or partially garbled data may indicate the TNC has been switched to KISS mode and needs to be switched back to TERMINAL. See the TNC documentation for instructions on how to determine what Interface Mode your TNC is in currently and how to change it to the Interface Mode you want.

Problem: All data from the TNC displays on one line

You have used a program (perhaps, one of the APRS map display programs), that set the TNC to not include a line feed character in the data sends to the terminal. You can restore the normal terminal display by setting the TNC command AUTOLF back to ON.

You may also need to set the command ECHO to ON.

Connect the MT1200 to Your Transceiver

The connections required between the MT1200 and your transceiver, are transmit audio, receive audio, PTT and ground. The radio port of the MT1200 is the configured the same as the radio port of our other TNC models, such as the KPC-3 Plus.

There are several sources of ready-made cables for this connection, or you may wish to make up your own cable.

If you wish to construct your own cable, use the following guidelines.

Parts needed for assembling a TNC to Radio cable

The following parts (shipped with your MT1200 unless otherwise noted) are needed for constructing the cable assembly that will connect your MT1200 and your transceiver:

- DSUB-9 connector kit (including hardware), for the MT1200' "Radio" port end of the cable.
- A 3-foot (0.91 m) length of 5-conductor shielded cable,
- A suitable connector or connectors for the radio end of the cable. Typically, the microphone connector (i.e., the Mic plug) and external speaker connector (plug), or a connector (plug) for the auxiliary input/output jack on the transceiver.

Preparing the Transceiver Cable Assembly

This section gives instructions for how to assemble the cable assembly needed to connect your transceiver to your MT1200, starting with the wiring requirements.

Wiring Directions (Connecting MT1200 and Transceiver)

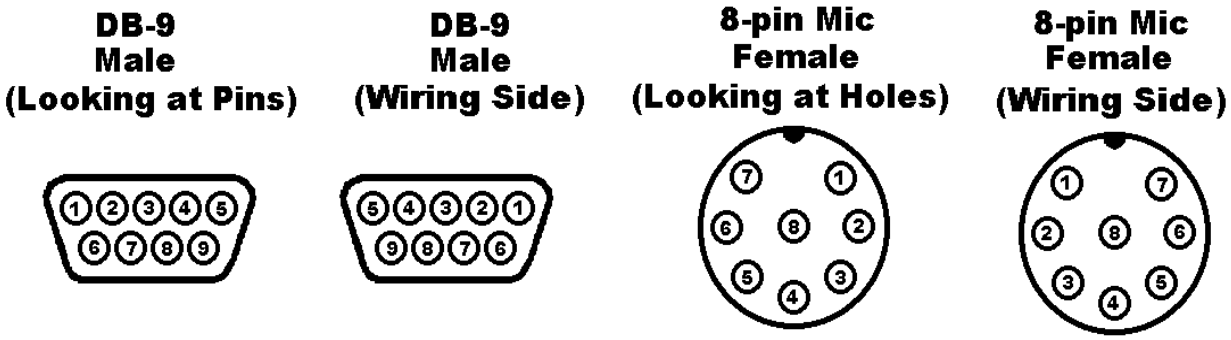
You will need to determine which pins on your DSUB-9 connector will be wired to which connections on your particular transceiver's microphone connector and speaker jack. Wiring directions are covered after the following examples of typical transceivers, including handhelds.

There are many different models of transceivers, each with their own exact requirements for how they are to be connected to devices such as a MT1200. While the following examples will help, you will need to refer to your transceiver documentation (or transceiver dealer) for exact instructions on which connections you need to make as you wire your transceiver cable assembly.

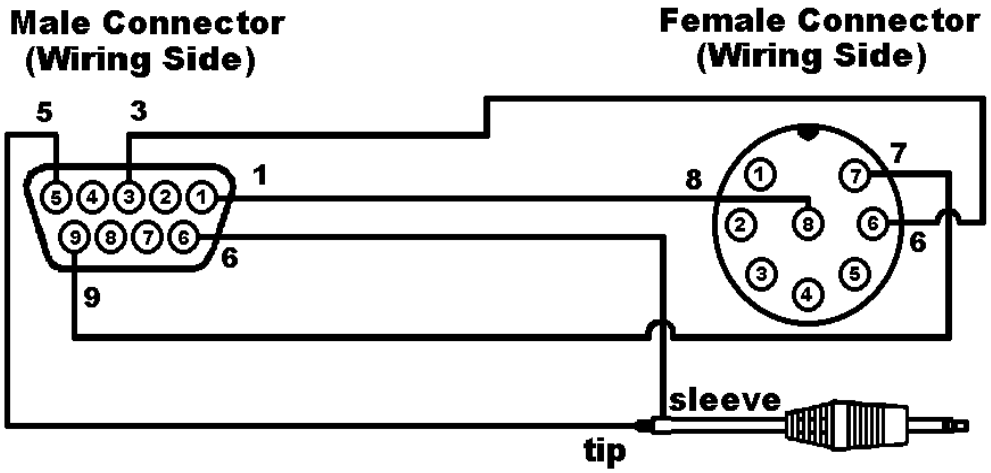
Note: If you need further assistance on your radio cabling, contact the radio manufacturer, your dealer, or a local amateur who has already installed a TNC. Kantronics is not likely to have pin assignments for specific transceiver models.

The following diagrams, used for example only, show wiring connections between the male connector for the MT1200' "Radio" port and transceivers (including HTs) from three major manufacturers: Yaesu, Icom, and Kenwood.

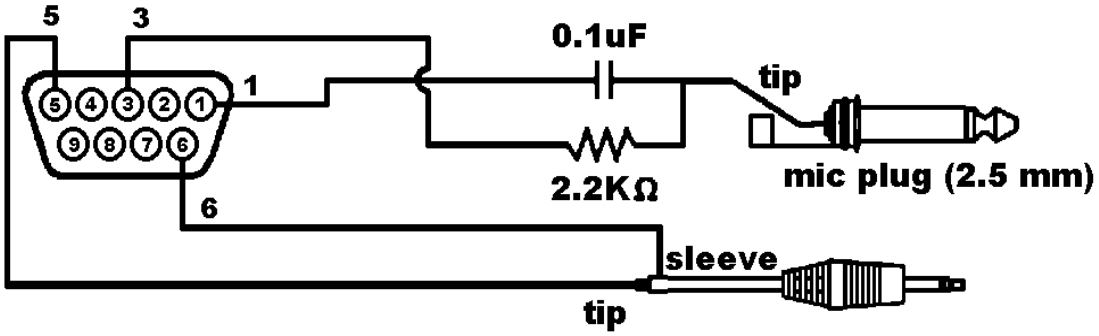
These diagrams may also apply to transceivers from other manufacturers, but you need to check to be sure how your transceiver needs to be wired. See the section on "Interfacing Hand-Held Radios" in the "Advanced Installation" appendix for further information.



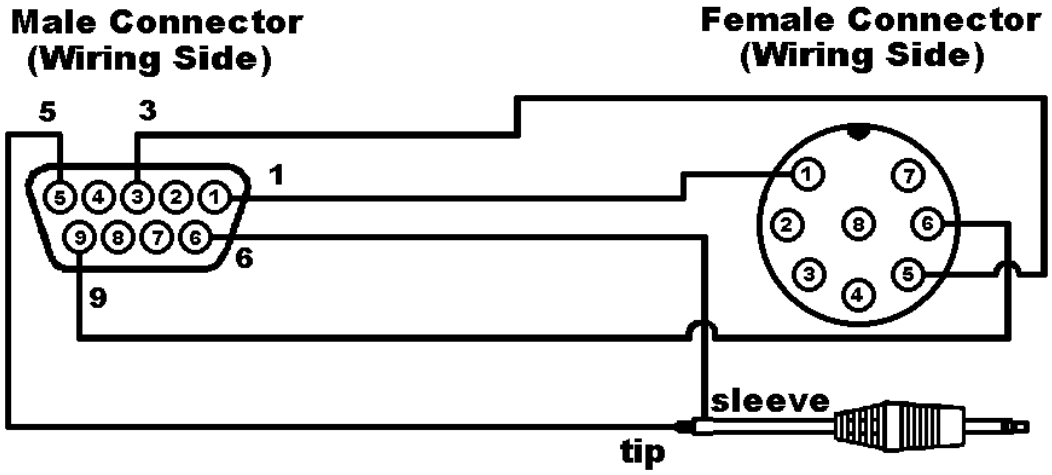
Yaesu Wiring



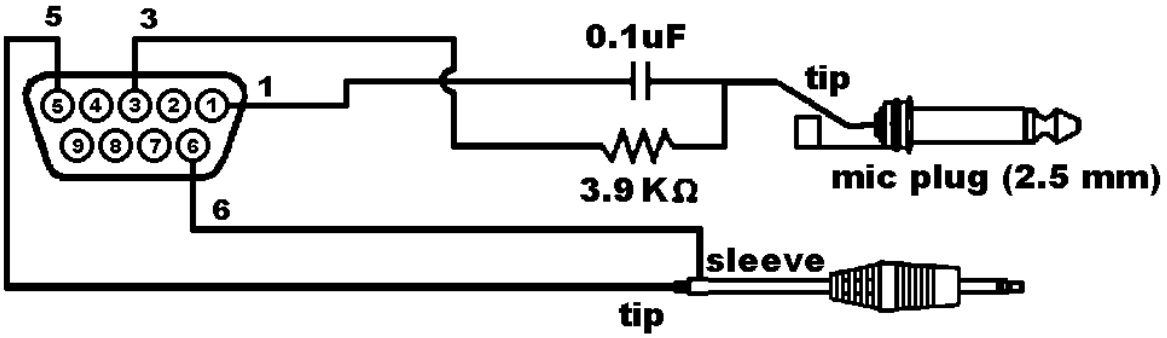
Yaesu Hand-Held Radios



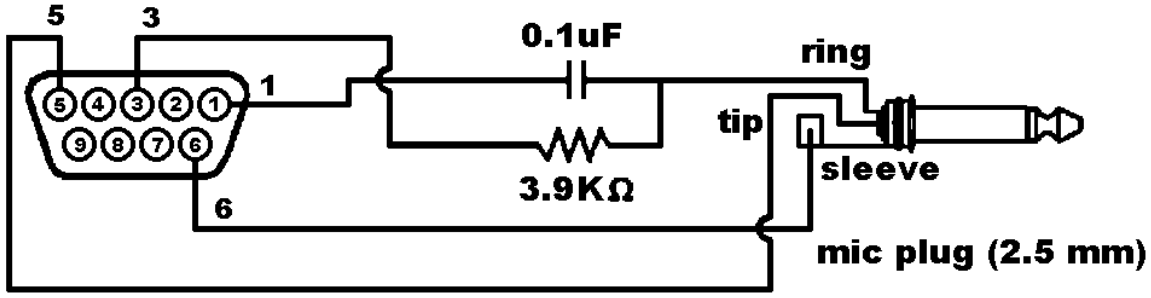
Icom Wiring



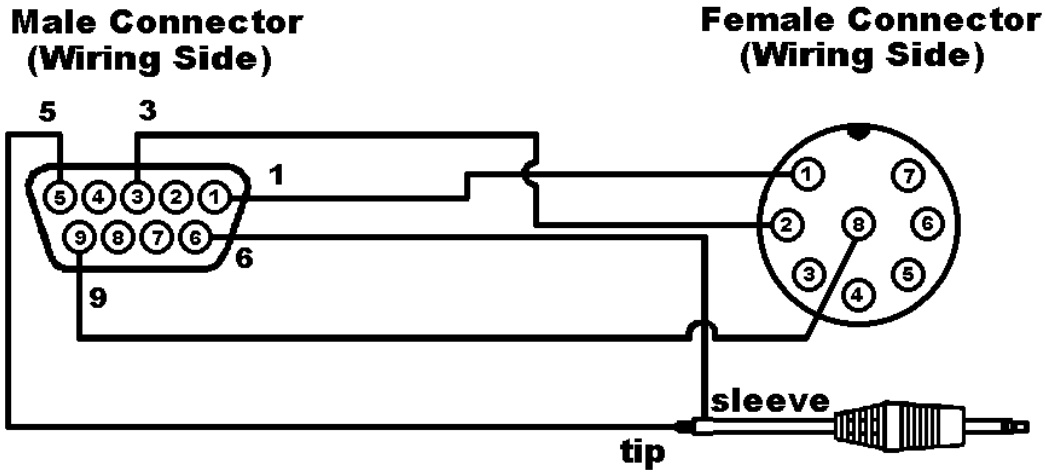
2 AT Style Hand-Held Radios



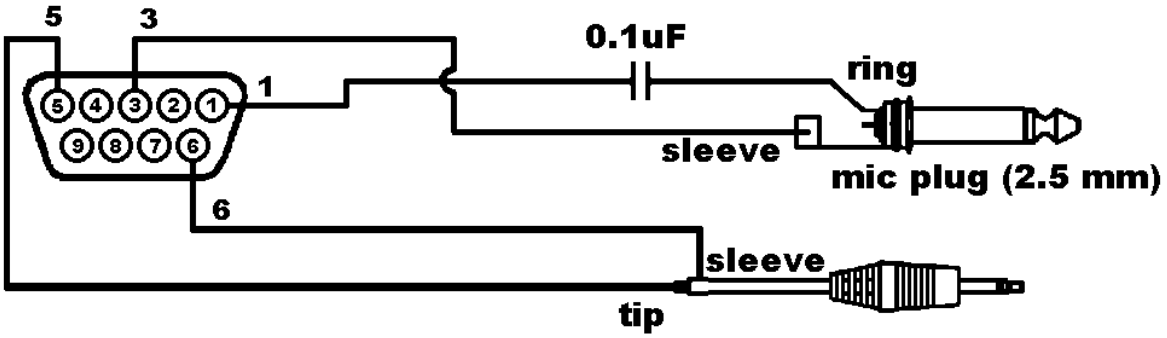
W2A Style Hand-Held Radios



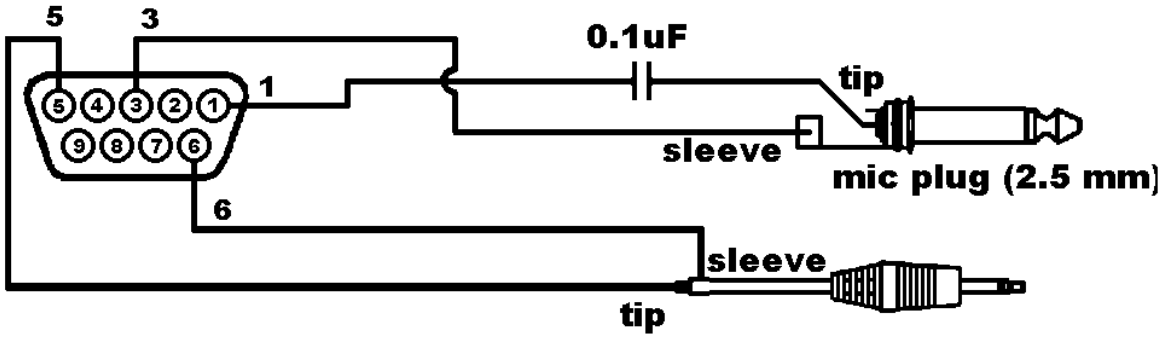
Kenwood Wiring



TR-2600 and later Hand-Held Radios



TR-2500 Hand-Held Radios



Your Transceiver's Microphone Connections to Your MT1200.

For the microphone on your transceiver, you may wish to make notes of the following connections, which you will use, for wiring your assembly:

- identify and make a note of the microphone input (which will be wired to pin 1, **transmit audio** on the MT1200' DSUB-9 "Radio" port),
- identify and make a note of the PTT or STBY connection (which will be wired to pin 3, **Push-to-Talk** on the MT1200' DSUB-9 "Radio" port),
- for base or mobile (but not hand-held) transceivers, identify and make a note of the ground connection (which, optionally, may be wired to pin 9, one of the **ground** pins on the MT1200' DSUB-9 "Radio" port, or left unconnected).

Your Transceiver's Speaker Jack Connections to Your MT1200

For the speaker jack on your transceiver, make a note of the following connections, which you will use for wiring your assembly:

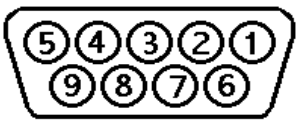
- identify and make a note of the connector to your external speaker plug (which will be wired to pin 5, **receive audio** on the MT1200' DSUB-9 "Radio" port),
- identify and make a note of the connector to your external speaker plug (which will be wired to pin 6, one of the **ground** pins on the MT1200' DSUB-9 "Radio" port).

Constructing the Cable Assembly

As you construct your cable assembly, it may be helpful to refer to the diagram on page.

Important: As shown in the diagram immediately below, looking at the rear panel, the pins in the MT1200' female DSUB-9 "Radio" connector are numbered from the ***upper right*** (pin 1) to the ***lower left*** (pin 9). As you connect wires to pins on the DSUB-9 connector on your cable, you need to be sure to connect to the correct pins.

As shown in the diagram below, if you look at the solder side (wiring side) of the male DSUB-9 connector, the pins are numbered (again) from ***upper right*** (pin1), to ***lower left*** (pin 9).



Similarly, when working with a typical 8-pin Mic connector where you know the pin numbers of pins, you need to consider which way you are looking at the connector (looking at pins/sockets or looking at the wiring side, where the wires are actually connected).

- **Hint:** Make notes of which wires (colors, cables) you use for each connection, so you will be able to keep track of which connection is which.

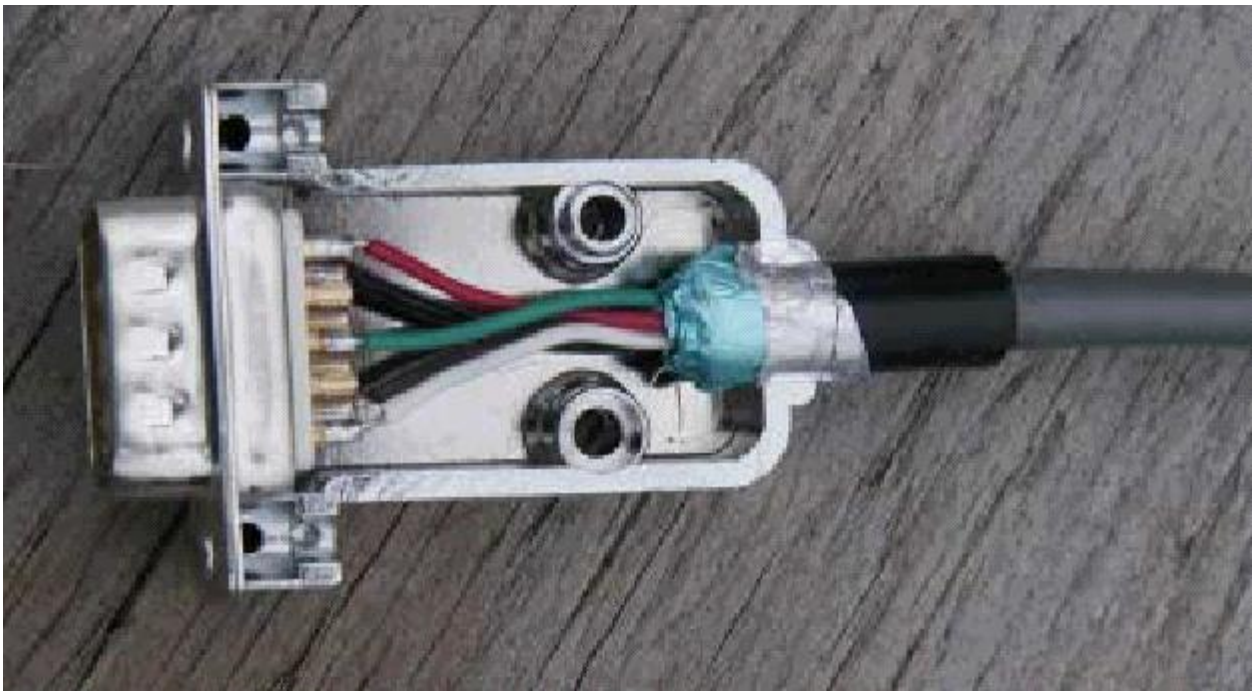
To construct your transceiver cable assembly, proceed as follows:

- **Hint:** You may find it easier to wire the male DSUB-9 connector if you first connect it to the MT1200 and use the MT1200 as a test fixture. This may also keep the male pins straight if you apply too much heat and soften the plastic in the male connector.

A shielded cable must be used with the shield properly terminated 360° to the connector.

Instructions for making a cable assembly using the supplied foil shielded cable and metalized plastic back shell follow:

1. Strip cable outer covering back enough to expose enough metalized plastic foil. Do not cut or rip foil.
2. Carefully loosen the drain wire and foil from around the insulated wires.
3. You will need to build up the diameter of the cable, where it enters the back shell, with any type of tape or sleeve, so that when the metalized plastic shell halves are screwed together they will hold the cable as strain relief and press against the metal foil.
4. Discard the metal strain relief pieces and screws that go with them—they are of no use.
5. Connect wires as needed to terminals of connector. Keep track of which wire is connected to which terminal.
6. Carefully fold the metalized foil back over the cable and Z-fold it so the metal side of the foil is exposed to the connector back shell at the entrance area. Spread the foil over the cable so you get as much coverage as possible (you will not get 360° coverage, but do the best you can).
7. Place the drain wire in the gap where you can not get foil coverage.
8. Place one of the shaped washers on each of the long, half-threaded screws, so they are next to the head of the screw (with the bent ends of the washers facing away from the heads of the screws).
9. Now place the metalized plastic shell halves together over the connector and cable, with the (2) two long half-threaded screws and two shaped washers, to attach the whole assembly to the MT1200.
10. When you screw the two halves together there should be enough compression to hold the cable in place and there should be solid contact between the metal side of the foil and the metalized back shell. See figure below.
11. If your radio is equipped with a single metal connector, then this same cable with connector attachment technique should be used. Otherwise follow the wiring directions that follow.



Wiring between your Transceiver Microphone and your MT1200:

Follow the notes taken above and wire the cable assembly in the following order:

Step 1. Using a user-supplied microphone connector appropriate for your transceiver and the notes taken above, attach wires as follows:

- Attach the wire from pin 1 (transmit audio) on the DSUB-9 to the microphone connector's transmit audio input pin,
- Attach the wire from pin 3 (push-to-talk) on the DSUB-9 to the microphone connector's PTT pin,
- (Optional) for base or mobile units, attach the wire from pin 9 (one path to ground) on the DSUB-9 to the ground pin on the microphone connector.

Connecting your Transceiver's Speaker Plug to Your MT1200

Use an appropriate third party speaker plug and the notes taken earlier to do the following wiring to the DSUB-9 cable assembly:

Step 1. Locate the wire that connects to the audio of the external speaker plug and attach it to the wire from pin 5 on the DSUB-9 (Receive Audio)

Step 2. Locate the wire that connects to the ground of the external speaker jack and attach it to the wire from pin 6 on the DSUB-9 (Ground)

This is all you need to do to wire the speaker plug part of the assembly.

Important: Keep your wiring notes for future reference.

This completes the construction of your transceiver cable assembly. Now it needs to be connected.

Connecting Your Transceiver Cable Assembly

Now you are ready to use this cable assembly to finish assembling your packet radio station.

Step 1. Check to be sure all the parts of your completed cable assembly are properly fastened and ready for connection to your transceiver and your MT1200.

Step 2. Turn OFF all power.

Step 3. Plug the male DSUB-9 connector on the cable into the female DSUB-9 connector on the MT1200' "Radio" port,

Step 4. Secure the male DSUB-9 connector on the cable to the female DSUB-9 connector on the MT1200' "Radio" port, by screwing the two long, half-threaded screws into the threaded nuts on each side of the MT1200' "Radio" port,

Step 5. Plug both the microphone connector and the external speaker jack into your transceiver.

Adjusting the Receive Volume of Your Transceiver

To adjust the receive volume of your transceiver to the proper level (or to confirm that it is already set at the proper level), do the following:

Step 1. Turn ON your computer (with your transceiver OFF),

Step 2. Start your terminal program,

Step 3. Turn ON your MT1200,

Step 4. If not already done, set the MT1200' baud (ABAUD) and CALLSIGN,

Step 5. Turn ON your transceiver and open the squelch control (turn it fully counter-clockwise),

Step 6. Slowly turn the transceiver's receive volume up until the RCV LED (receive indicator) on the MT1200 lights up (turns ON),

Step 7. Increase the transceiver's receive volume control slightly above the point at which the MT1200' RCV LED lit up (turned ON),

Step 8. Slowly turn the transceiver's squelch control clockwise until the MT1200' RCV LED goes OUT (turns OFF),

Now the receive volume control on your transceiver is properly adjusted for sending signals to your MT1200.

Your MT1200 is now installed and ready to use. You may now go to the "Getting Started" chapter, to learn how to do the basic operations with your MT1200.

If you do not see the receive LED light, check the cabling between the radio and the MT1200. Also, until it has been initialized from the computer, the MT1200 will not show ANY indication of receiving.

If you connected to a fixed level (unsquelched) receive audio from the radio, the receive LED on the MT1200 may remain on all of the time. In this case, set the parameter CD to SOFTWARE. Then, the receive LED will not light until valid packets are heard. (see CD in the commands section)

Transmit level adjustment

The 1200-baud data drive level (transmit audio voltage, TXA) from the MT1200 to your radio is adjusted digitally, using your keyboard and the transmit level (XMITLVL) or the calibrate (CAL) command. Previous models used a set of jumpers and an analog potentiometer (pot) to set this level. With the MT1200, no jumpers are used, just a command.

You should adjust the drive level to provide about 3 to 3.5 kHz of deviation with your radio. If you don't have access to a deviation meter, adjust drive so your packet transmissions generate about the same audio sound as packets heard from other stations.

The XMITLVL command has a parameter default value of 100; this corresponds to a drive voltage of about 50 mV. You may change this level by increasing the parameter/count. For counts below 256, the voltage is increased in 0.5 mV steps; above that, the drive increases roughly 15 mV per step.

For details, see the description of the XMITLVL command in the "Command Reference."

Alternatively, you may use the calibrate command (CAL) which has a zoom feature; that is, you can hold down the '-' or '+' key to decrease or increase the voltage (as you watch a meter or listen). See the commands section for more detail on these commands. The MT1200 must be in TERMINAL interface mode to access CALIBRATE mode.

For more information on installation topics, see the appendices.

Getting Started

This chapter gives you important information and examples to get you started using your packet radio station.

We assume you have installed your station and familiarized yourself with the use of with your MT1200, as covered in the chapters on “Installing your MT1200”.

If you have not yet installed your station, we suggest that you do so before continuing with this chapter.

Material covered here includes diagrams, explanations, and mini-tutorials on:

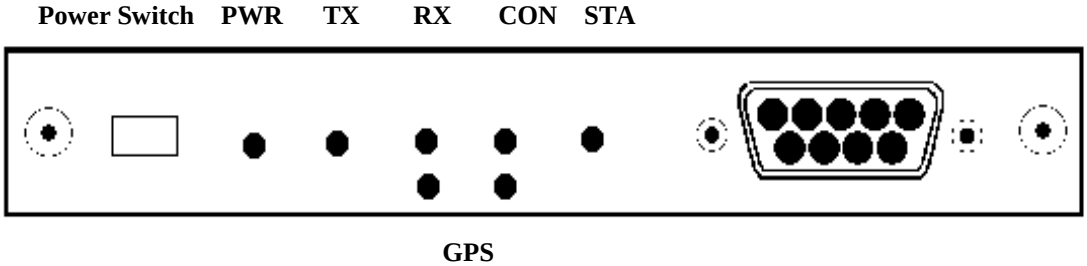
- the front panel of the MT1200,
- beginning a session,
- giving commands and transmitting data,
- monitoring transmissions from nearby packet radio stations, and
- connecting to another station and initiating a conversation, and
- configuring GPS settings and beacon intervals.

Reading this chapter (or just skimming the material, if you are already familiar with the topics) will also help you use the following chapters on different modes of use of the MT1200, the “Command Reference” chapter, and any appendices that are relevant to your needs.

The Front Panel of the MT1200

You have already used the POWER switch on the MT1200 to turn power on and off. This is a good time to get familiar with all the indicators on the front panel of the MT1200.

The following diagram shows the placement and function of the controls and indicators on the front of your MT1200, as well as a brief explanation of each:



The **Power Switch** turns power on or off in the MT1200.

The GREEN PWR LED indicator shows when the MT1200 is powered on.

The RED TX LED lights when transmitting.

The GREEN RX LED lights when receiving signals.

The GREEN CON LED lights when a packet connection is in progress with another packet station.

The GREEN STA LED lights when packets sent to a connected packet station have not yet been acknowledged by that station.

The RED GPS LED is ON, when the Internal GPS is enabled, but a connected GPS antenna is not detected. This LED flashes when the internal GPS is enabled, and GPS antenna is detected, but valid GPS position has not yet been calculated.

The GREEN GPS LED flashes once per second when valid GPS position is known.

NOTE: All front panel LEDs will remain OFF if the LED command is set to OFF.

Beginning a Packet Session

The steps involved in starting a session are covered in detail in the “Installing your MT1200” chapter.

Start HyperTerminal, select the MT1200 icon, and turn on the MT1200.

Once your initial setup is completed (including giving a CALLSIGN to your MT1200 and setting other parameters as needed), the first thing you will see each time you start a new session is a sign-on message from the MT1200 (sent to HyperTerminal and displayed on your computer screen) such as the following:

```
KANTRONICS MT1200 VERSION 1.07064
SERIAL NUMBER  xxxxxxxxxx
(C) COPYRIGHT 2007 BY KANTRONICS INC. ALL RIGHTS RESERVED.
DUPLICATION PROHIBITED WITHOUT PERMISSION OF KANTRONICS.
cmd:
```

The last line of this message (“cmd:”) is the MT1200’ report that it is in “Command” mode, which means that it is now expecting information from HyperTerminal to be commands for it (the MT1200) to interpret and carry out. Before learning about the specific commands you can give the MT1200, it is important to keep in mind the difference between giving the MT1200 commands and giving the MT1200 data that is to be transmitted.

Giving Commands and Transmitting Data

The MT1200 will react to data received from HyperTerminal (or any other source) either as a command to follow or as information to transmit.

Command Mode

When in the “COMMAND” mode of communication, the MT1200 will interpret data received from HyperTerminal (or any other source) as being a command to process, not as data to transmit. To instruct your MT1200 to connect, to disconnect, or to change any of the operating parameters in the MT1200 you must be in the COMMAND mode.

When placed in COMMAND mode (and ready to receive the next command) the MT1200 sends a “cmd:” prompt for display on the computer’s screen.

Converse (Conversation) Mode

When in “CONVERS” (conversation) mode, the MT1200 will interpret data received from HyperTerminal (or any other source) as data to transmit. In “CONVERS” mode, the MT1200 interprets most characters as information to be transmitted, while interpreting certain pre-defined characters (which the user can change) as control characters rather than as data to be sent. For example, a “backspace” character causes a backspace and is not transmitted.

The MT1200 will automatically switch to the CONVERS mode for you when you connect to someone or when someone connects to you and will return to the COMMAND mode when a disconnect occurs. When you are in COMMAND mode, you may switch to CONVERS mode just by giving the command K (or CONVERS). If you are in the CONVERS mode and want to force your MT1200 back to the COMMAND mode, you type a <Ctrl+C>.

TRANS (Transparent) Mode

A second way to transmit data is to instruct the MT1200 to ignore the "control characters" (e.g., "backspace") and just transmit every character as data. This is called the "TRANS" (transparent) mode of communication. For example, if data received by the MT1200 for transmission in TRANS mode includes "backspace" characters (i.e., characters that would cause a backspace in CONVERS mode), the MT1200 will transmit the backspace characters as part of the data.

Before you can switch to TRANS mode, you need to set INTFACE to TERMINAL instead of NEWUSER. (This is because, as described in the next section, the TRANS command is not a NEWUSER command.) To get out of TRANS mode and back to COMMAND mode, enter "<Ctrl+C> three times, with a pause of less than one second between each entry.

Check Your MT1200' Version Number and ID

To check your MT1200' version number and ID, all you need to do is ask to see the current setting of the command called VERSION:

Step 1. Go to COMMAND mode (if you are not already there).

Step 2. Type "VERSION" (or the short form, "V") and press the ENTER key to enter the command.

Step 3. The MT1200 will send its version number and other ID information for display on your monitor.

Get Help

To see a one-line explanation of any command that is currently available:

Step 1. Go to COMMAND mode (if you are not already there).

Step 2. Type "HELP," (or "?") followed by one or more spaces and the name of the command for which you want help.

Step 3. The MT1200 will send a short "HELP" message about the command, for display on your monitor.

View Current Values of Parameters

To see the current value of parameter(s) for any variable (other than the “immediate” commands, like CONVERS, that are simple actions, not settings):

Step 1. Go to COMMAND mode, as described above (if you are not already there).

Step 2. Type the name of the command for which you want to see current parameter value(s).

Step 3. The MT1200 will send a message consisting of the name of the command and the value(s) of its parameters for display on your monitor. For example, if you type INTFACE, you will see INTFACE TERMINAL.

As explained in the “Command Reference” chapter, the DISPLAY command can be used to see current values of ALL or a selected sub-sets of commands.

Change the Value of a Parameter

To change the current value of parameter(s) for any variable (other than the “immediate” commands, like CONVERS, that are simple actions, not settings):

Step 1. Go to COMMAND mode, as described above (if you are not already there).

Step 2. Type the name of the command for which you want to change the current parameter value(s), type one or more spaces, and enter the new value(s) you want for the parameter(s) for the command.

Step 3. The MT1200 will immediately change the value(s) to the values(s) you have just entered.

If you enter a value that is not possible (e.g., INTFACE MOON), you will get an error message (“EH?”). “EH?” simply means that the command you entered was not understood.

To confirm that the current value(s) is what you want, enter the name of the command and press ENTER. The MT1200 will send a message consisting of the name of the command and the current value(s) of its parameter(s) for display on your monitor.

Monitor Communications From Nearby Stations

A good way to start using your packet radio station is to monitor communications from nearby stations.

Amateur packet-radio activity is usually at VHF, on 2 meters, with 145.010 MHz being the most common packet-radio frequency. APRS reporting stations use 144.390 MHz. Most packet on VHF channels is at 1200 baud.

To monitor communications from nearby stations (after you have tuned in to an appropriate frequency):

Step 1. Set the command MONITOR to ON (if it is not already ON).

Step 2. Disconnect from any other station.

Step 3. As packets are received, you will see them displayed on your screen. A typical received packet might look like this:

```
NØKN>KBØNYK:
Hi Mike. How are you today?
```

The first line is the header line, and shows the callsigns of the stations talking and the following line(s) are the actual message that was sent. In the example, NØKN is the transmitting station, and KBØNYK is the receiving station. You may see the RCV LED light at times, indicating a signal is being received, but nothing displays on your screen. This is normal and may be the result of the settings of the monitoring commands, which are discussed in detail in the MT1200 Command Reference.

As you monitor, you will begin to learn about other packet stations in your area and then you will probably want to try to connect to one of them.

Communicate Directly with a Nearby Station

Now you are ready to carry on a two-way conversation with another station. Here we will see exactly what you need to do to connect to and converse with another station.

Let's say that you decide to connect to KBØNYK. The steps needed are as follows:

Step 1. First, be sure you have the MT1200 in command mode. To do this, type <Ctrl+C> and then press return. You should see a command prompt (cmd:).

Step 2. Now you use the CONNECT command. To connect to KBØNYK, you would simply type CONNECT KBØNYK and press return, just as you did in the sample connect to your mailbox.

In some cases you may need to use a relay station (called a digipeater) to contact another station. This is similar to using a voice repeater when the station you want to talk to is out of simplex range. To connect to a station using digipeaters, you still use the CONNECT command, but you must also specify the callsigns (or aliases) of the digipeaters that must be used. For instance, if you need to use two digipeaters with callsigns of WØXI and KCØCON in order to connect to KBØNYK, you would give the connect command as "CONNECT KBØNYK VIA WØXI,KCØCON"

Step 3. Once the connection has been made, you'll receive a message back on your screen from the MT1200 that says *** CONNECTED to KBØNYK (or, if you are using relay stations, *** CONNECTED to KBØNYK via WØXI, KCØCON). At that point you are ready to start talking to the other station since the MT1200 has already automatically switched into the CONVERS mode.

Step 4. After you have completed your conversation, simply press <Ctrl+C> to return your MT1200 to the command mode ("cmd:" will be displayed) and then you can instruct your MT1200 to disconnect as you did above with the mailbox, by entering D (or the full form, DISCONNE) and return.

As you begin working with your MT1200 packet radio station, other topics that you may wish to explore (with the help of other sections of this manual) include:

- doing hard and soft resets,
- communicating via relays with a distant station,
- using network nodes, and
- beaconing GPS data.

This concludes a quick tour of basic uses of your MT1200. With just these basics, you can do a lot, but you have a great deal more power if you want to explore the full possibilities.

For more information on all the topics we have covered here, and more, see the following chapters in this manual.

Modes of Operation

This chapter covers the major ways in which you may use your MT1200 TNC. For details on particular commands, see the “Command Reference” chapter.

Packet Mode

Protocol for Amateur Packet Radio: AX.25

The mode commonly called PACKET is defined by the protocol called AX.25. The details of the inner workings can be found in a book titled “AX.25 Amateur Packet-Radio Link-Layer Protocol”, which is available from the ARRL. Most TNC users will not need to or care to go into the details. The TNC takes care of the nitty gritty work for you, although there are parameters you can set that determine how efficiently some of that work is done.

Command Mode

In order to change parameters, or give any other instructions to the TNC, you must be in Command Mode. This is the mode you will be in when you first turn on the TNC or after resetting it.

Once you have left Command Mode for any reason, and now wish to return to command mode, you will need to enter a special character or characters. The parameter called COMMAND determines what special character you will use to return to Command Mode. This comes defaulted as a <Ctrl+C> (i.e., while holding down the control key, press “C”, then release both keys).

Whenever you enter Command Mode the TNC will send a prompt to your screen that looks like this:

```
cmd:
```

Connected vs. Unproto

There are two ways to send data in packet radio, connected or unproto (unconnected). In the Connected Mode you first establish a connection. Then your TNC will send packets to that specific station and expects acknowledgments in return. If an acknowledgment is not received, the TNC will resend the data (depending on the setting of AX25L2V2, it may send a poll first). The RETRY parameter will determine how many times this is done before the connection is lost due to bad conditions. If the acknowledgment is received, the TNC is happy and will send more data when available. Therefore the Connected Mode, barring impossible conditions, assures that the station you are connected to will receive everything you say, and in the order you say it.

In the Unproto Mode, when your TNC sends a packet, no acknowledgment is expected and no retries are attempted. This mode is often used for calling CQ, for transmitting beacons, and for informal round table chats.

Monitoring and Calling CQ

If you set the MONITOR command to ON, you will see other station's packets on your screen. You will notice two callsigns at the beginning of each packet separated by a ">". The first callsign is the station the packet is from, and the second callsign is the station the packet is to. An Unproto packet may have a name or CQ for the second callsign.

To set what will be seen as the "to" callsign for Unproto packets you send, you use the UNPROTO command. This comes defaulted as CQ.

In order to call CQ you must get into the Convers Mode, so that what you are typing to the TNC will be interpreted as data to be sent out on the air and not as commands. To do this type:

K<CR>

The <CR> indicates a "carriage return" or pressing the "ENTER" key on your keyboard.

Now anything you type will be packetized and sent out on the air. Remember to get back to Command Mode you enter a <Ctrl+C> (default) by holding down the Control key while pressing "C". You will be going between Command and Convers Modes depending on whether you want to talk to the TNC or have the TNC packetize what you type to go out on the air.

Flow Control

The flow control commands insure that the TNC gets everything that is sent to it by the computer and that the computer gets everything the TNC sends it. When the computer sends the TNC data, the TNC stores this data in a buffer until it can packetize it, send it, and get acknowledgments. Similarly, when the TNC sends the computer data, the computer stores the data in a buffer until it can be processed, stored to disk, sent to printer, or whatever.

This buffer area is of limited size; if more data is sent than will fit in the buffer the extra data will be lost. To make sure each device gets all the data it should from the other device, the two devices can tell each other to start and stop sending data. This is called Flow Control and it can be accomplished in either of two ways, via software or via hardware.

Which way you implement this depends on the capabilities of your computer communications program and personal preference. The cable between your computer and TNC must also be wired appropriately.

Software Flow Control

Software flow control sends special characters on the TXD and RXD lines of the RS232 cable. These are the same lines used for sending regular data between the TNC and computer. Software flow control normally sends a <Ctrl+S> to stop data and a <Ctrl+Q> to restart data. When a buffer gets close to full, the device will send a <Ctrl+S> and expect the other device to stop. When the buffer gets nearly empty, it will send a <Ctrl+Q> to tell the other device to send more data. How full or empty a buffer is, when the special characters are sent, is determined by the program. But, since the regular data lines are being used, a <Ctrl+S> sent as data from the keyboard will also stop data from the TNC. And likewise, if there is a <Ctrl+S> in a file being sent, data flow from the TNC will stop until a <Ctrl+Q> is received.

XFLOW needs to be turned ON for the TNC to use software flow control. XOFF determines the character sent by the TNC to stop the flow of data from the computer, and the XON character restarts the flow. The TNC expects the computer to send the STOP character to stop data to the computer and the START character to restart data. To use software flow control these commands would be set as follows: XFLOW ON, XOFF $13, XON $11, STOP $13, START $11. (Default settings.)

Two commands are provided to make it possible to send and/or receive these special characters in Transparent Mode and still use software flow control. TXFLOW enables flow control sent by the TNC to the computer and TRFLOW enables the TNC to recognize flow control sent by the computer. If both these commands are ON (and the above commands are set as stated) then software flow control will take place in both directions, to and from the TNC and computer.

If you are in Transparent Mode sending a file, the computer does not need to tell the TNC to stop and start (since you are sending the file). By turning TRFLOW OFF and TXFLOW ON, the TNC will accept START and STOP characters embedded in the file and send them along to the radio as data. Meanwhile, the TNC can send the XOFF and XON characters to the computer to control the flow of data from the computer. When receiving a file, turn TRFLOW ON and TXFLOW OFF; the computer will accept all data and use START and STOP characters to control the flow of data from the TNC.

Hardware Flow Control

Hardware flow control monitors the voltages on the RTS and CTS pins of the RS232 cable. Therefore these two pins must be wired between your TNC and a connected computer. The TNC holds CTS high as long as it can receive data. Once its buffer gets full, it pulls this line low. The computer program monitors this line. When it is pulled low, it knows to stop sending data. When the line is again pulled high by the TNC, the computer program will restart sending data. On the other hand the computer holds RTS high as long as it can receive data and pulls it low to tell the TNC to stop sending data. The TNC always uses hardware flow control, so only wire the RTS and CTS pins if your computer program is also using hardware flow control.

HyperTerminal uses hardware flow control in its default settings, but some communication software does not.

Convers Mode vs. Transparent Mode

In the Convers Mode there are many special characters. To list a few:

Command	Default	Description
SENDPAC	<Ctrl+M>	Causes a packet to be formed
DELETE	<Ctrl+H>	Backspace character
REDISPLAY	<Ctrl+R>	Redisplays the keyboard buffer
CANLINE	<Ctrl+X>	Cancels a line
STOP	<Ctrl+S>	Stops output from TNC to computer
PASS	<Ctrl+V>	Pass a special character

These characters are all very useful when having a packet conversation with someone. If you want to send a packet you hit the return. If you make a mistake you can erase characters, using the delete or backspace key, or kill the whole line with <Ctrl+X>. And if you really want to transmit one of these characters, you can always precede it with a PASS character.

Transparent Mode was designed for the sending of files, whether they be ASCII data files or program files. Special characters have no meaning to the TNC in transparent mode, they are just characters to be put in a packet and sent to the radio.

In Transparent Mode, a SENDPAC character will not cause data to be formed into packets; instead, packets are formed at a rate that is set by PACTIME.

All monitor commands are treated as OFF in Transparent Mode. All you will see is what is being sent to you. You would probably want to set USERS to 1 so no one interferes with the transfer. The setting of ECHO is also ignored. Even if ECHO is ON Transparent Mode will not echo to the attached terminal. Some programs allow for local echoing to the screen while uploading.

Exiting Transparent Mode

Getting into the Transparent Mode is easy: you just type a “t” in Command Mode. But since Transparent Mode allows the sending of all characters you can not get out of Transparent Mode by just typing a <Ctrl+C> (COMMAND character) as in Convers Mode. In order to get out of Transparent Mode, you must follow a special sequence, or use a modem break if your program supports one. The special sequence must be followed precisely. This example assumes the COMMAND character is <Ctrl+C> and CMDTIME is 1 second:

- Wait at least 1 second since the last character was sent from the computer to the TNC

- Type a <Ctrl+C>
- Within 1 second type a second <Ctrl+C>
- Within 1 second type a third <Ctrl+C>
- Wait 1 second and the cmd: prompt should appear

If the guard time of one second before and after the three <Ctrl+C>s is not there, the TNC assumes that they are data and sends them to the radio, so be sure to allow at least one full second before and after the three <Ctrl+C>s.

In most cases, you can simply press and the CONTROL key, then press the C key three times quickly, then release the CONTROL key.

LINESUB mode

Linesub Protocol Description

The LSUB mode of operation provides a method of transmitting-and receiving raw ASCII data via a radio. Data is sent and received in a totally transparent fashion, allowing all ASCII characters to be utilized (hex 00 through hex FF). There is no addressing, error-detection or automatic retransmission of the data. When the receiving modem detects the proper Start-of-Data sequence generated by the transmitting modem, it will output the data that follows to its; serial port. At the end of the received data there is an End-of-Data sequence that permits the receiving modem to recognize the end of the data and quit translating the receiver audio. This allows the modems to operate with open squelch audio from the radios. Since the protocol constitutes a very small portion of the transmission, the effective data throughput is very nearly that of the radio baud rate (1200).

Commands active in LINESUB

TXDELAY - The TXDELAY (TXD) command determines how long the modem must key the Push-to-Talk line of the radio before sending data. This time will have to be determined experimentally since it will vary from radio to radio. If the TXD is set too short, the data transmitted will be garbled and not received by other units in the system. Setting TXD too long will reduce channel capacity.

PACTIME - The PACTIME parameter determines how long the modem will wait after receiving data to be transmitted from the DTE before beginning the radio key-up sequence. Normally, this parameter should be set to AFTER 1 (100 ms.) in order to minimize "dead-air" time on the system.

PERSIST and **SLOTTIME** - These parameters determine how aggressively the modem will attempt to access a multi-user channel based on carrier detect. See KPC-series manual for a full explanation of these parameters.

Entering LSUB Mode

When you have made any desired changes from the default settings for the above parameters, use the INTFACE command to begin LSUB operation. Set the INTFACE command to LINESUB:

cmd:INTFACE LINESUB <cr>

and turn the unit off and then back on. Be aware that there is *no* data flow control.

Exiting LSUB Mode

If you want to exit LSUB mode to "fine tune" parameter settings (or for any other reason), the Command mode of the modem can be regained by using the transparent data escape sequence, i.e., by sending a series of three control-Cs (unless a different control character has been defined). (See TRANS command in the Reference Manual).

Modem Mode

In MODEM mode, the TNC demodulates the audio signal from the radio on port 1 and passes this data through to its RS232 port unmodified. No “protocol” adjustments are made to the data; the TNC simply acts as a dumb modem. In other words, it simply reflects out the RS232 port what it “sees” coming in the radio port. For example, if ASCII information is received at 1200 baud, the TNC presents your computer with ASCII at 1200 baud. With a simple terminal program running at 1200 baud too, you’d be able to copy the text.

To place the TNC in modem mode use the INTface command. At the cmd: prompt, type INT MODEM and return. Then turn your TNC power OFF and back ON.

To leave modem mode, send three Ctrl+C (command) characters to the TNC at 1200 baud. If ABAUD was set to something other than 1200, that setting will remain after you exit modem mode. Hence it may be convenient for you to set the TNC to 1200 baud before entering modem mode.

➔ Note: Some computers may lose some of the data stream if a full RS232 cable is used. This can occur because the RS232 DCD line, which is “tied” to the TNC’s receive LED, may be cycling up and down. In this case, set CD to EXTERNAL before entering INT MODEM.

Copying Weather Broadcasts NWS EMWIN

MODEM mode can be used to copy emergency weather broadcasts by the National Weather Service. The NWS Emergency Managers Weather Information Network (EMWIN) is a wireless direct-to-computer information service that the National Weather Service (NWS) provides with help from the Federal Emergency Management Agency. The NWS feeds a constant stream of weather information (@ 1200,8,N,1), from around the world, to a satellite orbiting the Earth. Many cities are coming on line now to capture this stream and rebroadcast it on fixed VHF commercial FM frequencies just above the 2-meter ham band.

Using your TNC in MODEM mode, with a PC and communications software, you can copy these broadcasts. The content of the broadcasts may be plain ASCII text (copyable with HyperTerminal) or graphics. For updated information on EMWIN and software to copy its modes, search the Internet.

To copy the broadcasts, simply cable together the equipment mentioned above, tune your VHF FM receiver to the local EMWIN frequency, set the INTFACE command to MODEM, and follow the text on your PC screen.

KISS Mode

Amateur packet radio communications can use the TCP/IP suite of protocols instead of AX.25 by switching to KISS mode and running software that supports the KISS code designed by Phil Karn (see references at end of this section). The KISS protocol specifies the communication between a TNC and a host (e.g., computer).

KISS Mode allows the TNC to act as a modem and packet assembler/ disassembler (PAD). In KISS Mode, data processing is shifted from the TNC to a computer running special software supporting the KISS code designed by Phil Karn. KISS code supports higher level protocols (i.e. TCP/IP) for sharing computer resources in a network fashion. Examples of TCP/IP programs are NET, NOS, and JNOS. Also, some networking software (G8BPQ) requires the KISS Mode of operation.

Technical Note*: In the KISS Mode, the TNC simply passes all received data to your computer, and the computer program is responsible for all processing of that data, including decisions concerning routing, digipeating, and other control decisions. The TNC converts the packets of synchronous data being received from the radio link into packets of asynchronous data to be passed to the computer over the serial port, and converts the packets of asynchronous data from your computer into the synchronous format suitable for radio transmission. The TNC retains the responsibility of determining proper timing for channel access.*

To place your TNC in KISS Mode, you must first have the command prompt (cmd:). Then type INTFACE KISS and press return. And, finally, do a RESET.

After that you will not see any message or any prompt back from the TNC, it will now be in KISS mode.

If you turn your unit off while it is it INTERFACE KISS mode, it will still be in KISS mode when you turn it back on. To get out of KISS mode:

- perform a hard reset, or
- use the KISS exit command (available in KISS software while in KISS mode), or
- send the C0 FF C0 (hexadecimal) sequence from your keyboard.

To send the C0 FF C0 sequence, in decimal values, from your keyboard (using the number keypad on a PC compatible computer keyboard):

1. Press and HOLD the ALT key. Type the numbers 192 from the numeric KEYPAD. Release the ALT key.

2. Press and HOLD the ALT key. Type the numbers 255 from the numeric KEYPAD. Release the ALT key.

3. Press and HOLD the ALT key. Type the numbers 192 from the numeric KEYPAD. Release the ALT key.

If the terminal program you are using sent all those characters, the MT1200 will exit KISS mode.

References on KISS Mode

Karn, P.: “TCP/IP: A Proposal for Amateur Packet Radio Levels 3 and 4", pp. 4.62-4.68 ARRL Amateur Radio Computer Networking Conferences 1-4, Newington, CT: ARRL, 1985.

Chepponis, M. and Karn, P.: “The KISS TNC: A Simple Host-to-TNC Communications Protocol”, pp. 38-42, 6th Computer Networking Conference, Newington, CT: ARRL, 1987.

XKISS (Extended KISS) Mode

The TNC also supports the G8BPQ multi-drop KISS Mode, called extended KISS (XKISS). With this mode, the TNC can be connected to a G8BPQ node along with the other TNCs on the same serial port, to provide multiple radio ports to the node. Otherwise, XKISS works like KISS. For information on this mode of operation, see the documentation for the XKISS software you are using.

Remote Access

You can connect to your MT1200 from a remote station and change values of its parameters. This allows you to add or delete stations from the LLIST, change the MYCALL or any other command setting, read the analog inputs, set control line outputs, and so on, all remotely.

Extreme caution must be used when you are accessing your TNC from a remote location. There is no built-in safeguard, and as such it is possible for you to change parameters such that the remote TNC will no longer communicate with you.

In order to change parameters in a remote TNC, the RTEXT in that remote TNC must be set to a text string that will be used as the password string. For instance, you might set your RTEXT to:

```
RTEXT  Code
```

The remote TNC must also have its MYREMOTE set to a unique callsign (i.e. WØABC-4, or XYZREM). If these two parameters are not set, remote access to the command set of this TNC is not possible. When these parameters are set, you can connect to the MYREMOTE callsign of the remote TNC.

When the connection is made, the remote TNC will send three lines of numbers. The numbers may look like:

```
1 1 1 3 4 3
3 1 4 3 1 3
2 1 1 2 1 3
```

You must then pick ONE of these lines and decode the password string. Let's say you choose to decode line 3 (2 1 1 2 1 3). Rewriting your RTEXT string to make this easier you would have:

Character #:	1	2	3	4
Letter:	C	o	d	e

Therefore, to gain remote access, you must send the following string:

```
oCCoCd
```

Note that case is significant and spaces are considered valid characters.

If you fail to properly decode the password, the TNC will send three new lines of numbers. You will be given a maximum of three attempts to properly decode the password string. If you fail in three attempts, the TNC will disconnect you and disable connects to the MYREMOTE for 15 minutes. Also, if you connect to the MYREMOTE and start the password sequence but then disconnect, the penalty timer is in effect for 15 min.

Take care when using the remote access feature. You can change ANY command in the TNC without restriction, but this can lead to problems. For instance, if you change the INTFACE command to KISS and then send a RESET command, the remote TNC will be placed into the KISS mode and will completely quit talking to the radio! Also, if you connect to the MYREMOTE of a TNC and then issue a command like CONNECT W1ABC, the remote TNC will indeed attempt to connect to the station, but there will be no data sent to you from that connection. The connected data would be sent to the serial port of that remote TNC. We urge EXTREME caution when using the remote access! Note also that any command that causes a reset will disconnect you from the remote access.

One other minor limitation applies to receiving data from the remote TNC. When you give any command, the response is limited, so some commands will not fully display their response, or no display will be available. For example, if you give the command DISPLAY, there will be no display content. There is too much data to pass through the remote connection from the MT1200. Any single command can be queried, and get a display of its current setting.

GPS Beacon

The MT1200G includes a GPS device inside. This GPS device is a small module, made by Trimble.

The MT1200 does not include a GPS inside. To utilize GPS functions with the MT1200, an external GPS receiver is required.

Unlike other, more full featured Kantronics TNCs, the MT1200 has one GPS buffer and beacon, which transmits text as defined by its GTEXT command.

The GPS beacon can be set with a simple fixed interval, based on the interval entered, and/or the beacon interval can be variable, based on other specified conditions.

Configuring the GPS Beacon

To configure your MT1200 in GPS Mode you must set several command parameters from your PC keyboard as follows:

- select the GPS string you wish to transmit
- set the GPS beacon rate
- enter the unproto path for the GPS beacon

You determine which GPS string will be transmitted (and displayed locally) by entering the string header with the GTEXT command.

The beacon interval is determined by the setting of the GBEACON command.

The destination address and the path for the beacon is set by the GPATH command.

Setting Parameters

Your MT1200 must be in Terminal mode, and be communicating with your terminal.

First, select the specific sentence (and/or other variables), that you wish to display and be transmitted in the beacon. The command would be **GTEXT $var$$var$ (etc.)** where var is any of its available NMEA strings or in combination with other variables (GGA, GLL, RMC, VTG, LAT, LONG, UTC, OFFSET, DATE, ALT, ESPD, NSPD, USPD, SOG, TRACK, NUMSAT, TEMP, VOLT, ANA1, ANA2, CHKSUM).

For instance, if you want the TNC to transmit (or display) the $GPGGA string, use the command:

GTEXT $GGA$$CHKSUM$ <CR>

Each variable name must be enclosed in $ characters and entered in CAPITAL letters. The NMEA strings usually begin with a $ also, and that is entered with the variable string. The entry above designates the $GPGGA sentence with a checksum. A maximum of 126 characters can be entered in the GTEXT command. Note that the transmitted data can be more than 126 characters, depending on the variables specified.

Next, set the interval of the beacon, with the command GBEACON. The interval can be from 1 per second, or up to 1 in 24 hours. Other options can be added, such as when to start the beacon (number of seconds from the top of the minute or hour), or sending a beacon after some change in GPS position (distance traveled) or direction.

For example, if you want to beacon to GPS via a digipeater (called WIDE1-1), and you want the beacon to occur every 30 minutes, use the following commands:

```
GPATH GPS via WIDE1-1

GBEACON EVERY 00:30:00
```

Several amateur groups, such as APRS (see the bibliography at the end of the GPS section), have developed special programs for enhancing amateur GPS activities. Check with them for current practice in setting GPS beacon paths, beacon rates, and frequencies used in your area.

Other GPS Beacon Features

Slotted Beacons

The GBEACON command provides for the ability to specify not only the interval between beacons, but a starting time for the beacons. This permits a “slotted” system of beacons by numerous stations. For instance, lets say your local area has 30 stations that each should beacon their location every 30 minutes, each with its own unique time slot to avoid packet collisions so all stations can be heard. A beacon would be transmitted every n minutes from the time the user sets the time that the beacon should be transmitted. As an example, if you set the beacon interval with the command:

```
GBEACON EVERY 00:30:00 START 00:00:01
```

the TNC would transmit a beacon at 00:00:01 (time after midnight) and every 30 minutes after that, in its own particular time slot. The second user could set the beacon interval with the command:

```
GBEACON EVERY 00:30:00 START 00:01:01
```

In this case, these two users would never beacon at the same time, in fact they would beacon 1 minute apart. Using this system for our example, it is possible to set all thirty users to beacon one minute apart, avoiding collisions.

Note: If the START option is specified, the following beacon interval modifiers are disallowed.

Beacon intervals based on speed, distance, or direction change

Other optional parameter settings for GPS Beacons are IDLE, APPEND, CLEAR, DISTANCE, CORNER, START. Each option has a precedence, based on its position in the GBEACON string of arguments. After a GPS beacon has been transmitted, all interval timers are re-started.

The first setting is simply a fixed interval, for GPS beacon transmissions. It can be set to beacon as often as once per second, up to once per 24 hours.

The first option setting is IDLE. You can specify a period of time of no movement of the vehicle for the GPS beacon to be transmitted.

The setting APPEND is used in combination with pin 7 on the radio port of the MT1200. That input should be a connection to the PTT line of your transceiver, along with your microphone. If APPEND is specified, a GPS beacon will be transmitted upon your release of the microphone PTT.

If the setting CLEAR is used, the GPS data buffer will cleared after a GPS beacon has been sent. This can be used to prevent old or invalid GPS data from being transmitted.

If the setting of DISTANCE is used, a GPS beacon will be transmitted after having traveled the specified distance (in meters or yards).

If the setting CORNER is used, a GPS beacon will be transmitted after the specified change in direction has occurred (with an option of velocity, in KPH, KNOTS, or MPH).

Remote Access and GPS

The TNC commands can be accessed or changed from a remote packet station, by connecting to the MYREMOTE callsign in the MT1200.

When you connect remotely to the TNC (and properly respond to the password security check) you can change any parameters including the GPS parameters. More detailed information is in the REMOTE ACCESS section.

GPS Command Summary

The following GPS commands are listed here for convenience and explained in detail in the Command Reference section.

GBEACON {EVERY | AFTER} hh:mm:ss [START hh:mm:ss]

This command sets the interval between beacons for the beacon.

GTEXT var

This command determines which GPS NMEA sentence and/or other variables will be contained in the beacon.

GPATH dest [via call1[,call2,...]]

This command sets the destination callsign and the digipeaters used to transmit the GPS beacon.

RPRINT text (text up to 128 characters)

This is an immediate command, used when connected to the MYREMOTE callsign from another station, which outputs the specified “text” string from the serial port of the TNC to the attached device. This can be used to “query” a device such as an RTU (weather station, etc).

PING callsign

This is an immediate command. When entered with a callsign, a special “PING” packet will be sent to the specified callsign. If that TNC is another MT1200, it will send a PING response packet with its current GPS information (as specified by the GTEXT setting).

Bibliography

For more information on the Global Positioning System, we recommend the following resources:

General Information

Bruninga, Bob, WB4APR, “Automatic packet reporting system (APRS)”, *13th ARRL Digital Communications Conference Proceedings*, 1994. (address: ARRL, 225 Main Street, Newington, CT, 06111).

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Langley, R., “The mathematics of GPS”, *GPS World Magazine*, July/August 1991.

“NMEA 0183 ASCII Interface Standard”, (NMEA 0183 version 2.0), NMEA, P.O. Box 50040, Mobile, AL 36605.

Advanced GPS (or APRS) Digipeating

The “UI” digipeating commands described in this section add flexibility in reporting GPS (or APRS) station positions. It is an established procedure of the reporting stations to digipeat with generic callsigns and through a number of repeaters (e.g., “APRS” repeaters). In this way, reports of their positions can reach out, via a number of digipeaters, to any wide area. At the same time, the digipeaters supporting these activities must establish their TNC parameters such that all UI frames “copied” are digipeated often enough (enough repeats of each frame), but not too often (too many repeats of each frame), to achieve the desired result.

The commands introduced here (i.e., UIDIGI, UIFLOOD, UITRACE, and UIDWAIT) allow each digipeater owner a wide range of ways in which to configure their TNC (in cooperation with other digipeaters in a network, who all need to work together) to establish an optimum GPS (or APRS) repeating network.

+ **Note**: This section assumes you are familiar with GPS, digipeating, and APRS (each topic is discussed elsewhere in this manual). For details about APRS (A Packet Reporting System) developed by Bob Bruninga, WB4APR, consider obtaining a copy of “Getting On Track with APRS,” by Stan Horzepa, 157 page paperback, published in 1996 by the ARRL, 225 Main Street, Newington, CT 06111.

Amateurs are using GPS receivers, a packet unit, and an FM transmitter to report the location of their vehicles or stations to others. Their broadcasts use one-way (unproto UI) packets, reporting call sign, latitude and longitude. Packet stations hearing these broadcasts can monitor the location of the vehicles.

A common goal of these position reporting stations is to digipeat a UI packet over a wide area (or a long distance), while moving though areas where the local callsigns may be unknown. An effective solution for not knowing local callsigns is to establish standard generic callsigns for digipeating stations and then use these names in digipeating paths. Of course, this requires the acceptance and use of standards for naming and using digipeating stations, by both the position reporting stations and the digipeating stations.

Common standards have been established by some local APRS groups, with names such as RELAY, WIDE, and TRACE. We encourage you to contact your local GPS (or

APRS) interest group before configuring your TNC with its new digipeater capabilities. Usage may vary by area.

Improving Efficiencies of Advanced Digipeating

As described above, mobile location reporting stations are using digipeating paths containing generic digipeating names (e.g., RELAY, WIDE, TRACE) to extend their range of reporting. Using generic digipeating enables a mobile station to use the same digipeating path as it moves around, since there will (presumably) always be nearby GPS (or APRS) digipeating stations with one or more of these generic names to pick up transmissions (i.e., UI packets) and re-transmit them to a wider area.

Using generically named digipeaters does result in wider coverage of GPS stations, but several inefficiencies may arise from this common practice (depending upon the availability and names of the digipeaters).

Among the problems that may arise in this situation are that: (1) UI packets can be repeated much more than necessary, by the same or by different digipeating stations with the callsigns RELAY, WIDE, or TRACE clogging up the airwaves, and that (2) several stations may re-transmit the same packet at the same time, resulting in a combined signal that cannot be copied by other stations.

Kantronics' TNCs have a suite of UI digipeating commands that can be used to deal with inefficiencies that can arise when a number of digipeaters are transmitting in the same area, at the same time, using the same generic names.

Overview of UI Digipeating Commands

The following UI digipeating commands support advanced GPS (or APRS) digipeating capabilities.

The **UIDIGI** command may be used to set up to four additional aliases/call signs for "special" digipeating service. To-be-digipeated packets received containing one of these aliases will be repeated (once) with the call sign (MYCALL) of the digipeater substituted for the alias in the digipeated frame. See the example shown below and the command description for more detail.

UIFLOOD and **UITRACE** are a bit more exotic. Each provides for multi-hop digipeating with just one digipeater address per packet, thereby keeping the transmission time short. For example, to digipeat through two TNCs supporting the UIFLOOD command, the reporting station might set a GPS position path as follows:

LTP 1 GPS via WIDE2-2.

A digipeater TNC supporting "wide" set by the UNIFLOOD command and hearing the reporting station's transmission would then digi the UI location packet (assuming it had not done so already, within a preset time), using an address of wide2-1. In turn each similar digipeater down line would digi the reporting station's UI packet and reduce

(decrement) the ssid of the digipeater address again. A TNC using UIFLOOD has the option of inserting MYCALL, creating two rather than one digipeater addresses in each transmitted digi packet.

With UITRACE, each time a packet is digipeated, each TNC adds its MYCALL, thus creating a “trace” or return path. In effect, the size of the packet grows by one digipeated address with each hop. A parameter, n, sets a delay time “do not digipeat within n seconds.” Again, see the examples below and the command descriptions for detail.

The current setting of UIDWAIT determines whether or not a delay is added to UI digipeat packets (those formed by UIDIGI, UIFLOOD, or UITRACE) before transmission, once the channel is clear. If UIDWAIT is ON, the delay is determined by slottime or persist settings.

Each of these commands is documented in the “Command Reference”.

> **Note:** Digipeater priority for call signs is as follows: UIDIGI, UIFLOOD, UITRACE, MYCALL, MYALIAS (e.g. if you assign the same call sign to UIDIGI and MYALIAS, a to-be-digipeated frame with that call sign will be digipeated according to the rules that apply to UIDIGI).

Using “UI” Digipeat Commands: UIDIGI, UIFLOOD, and UITRACE

The following are actual monitored outputs of a lab system consisting of one position reporting station and three digipeaters, where each digi is configured using the UIDIGI, UIFLOOD, or UITRACE command and where UIDWAIT is set ON. We set UIDWAIT ON to force the system to digipeat all or most of the UI frames without collision. In all examples, the reporting station, WØXI, is used to launch a UI packet with the path set by the UNPROTO command.

With UIDWAIT OFF, several digipeaters would transmit at the same time, resulting in corrupted packets. In actual on-the-air use, a system of digipeaters may work well with UIDWAIT OFF, depending upon their mix of location and transmitter power.

In actual use, GPS (or APRS) reporting stations would set their path with the LTP

Configuring Three Digis Using the UIDIGI Command

Here, three digis, with MYCALLs of A, B, and C, are configured with aliases of RELAY, WIDE, and TRACE (using UIDIGI); and UIDWAIT is set ON. For example station A’s UIDIGI aliases are set as follows:

```
cmd: UIDIGI ON RELAY, WIDE, TRACE
```

The reporting station path is then set to GPS via RELAY, WIDE, TRACE, and a UI packet is launched.

Any one of the stations monitoring will then display the resulting action as follows:

```
cmd: WØXI>GPS,RELAY,WIDE,TRACE: <UI>:5
WØXI>GPS,B*,WIDE,TRACE: <UI>:5
WØXI>GPS,A*,WIDE,TRACE: <UI>:5
WØXI>GPS,B,A*,TRACE: <UI>:5
WØXI>GPS,A,B*,TRACE: <UI>:5
WØXI>GPS,C*,WIDE,TRACE: <UI>:5
WØXI>GPS,B,C*,TRACE: <UI>:5
WØXI>GPS,A,C*,TRACE: <UI>:5
WØXI>GPS,B,A,C*: <UI>:5
WØXI>GPS,A,B,C*: <UI>:5
WØXI>GPS,C,A*,TRACE: <UI>:5
WØXI>GPS,B,C,A*: <UI>:5
WØXI>GPS,C,B*,TRACE: <UI>:5
WØXI>GPS,A,C,B*: <UI>:5
WØXI>GPS,C,A,B*: <UI>:5
WØXI>GPS,C,B,A*: <UI>:5
```

All digis hear the first UI frame and store it. Due to the setting of UIDWAIT, some stations may wait longer than others to digipeat; hence, when they do, they may have several frames stored up - for example, the original and a digipeat from another station. Trace station B as an example. It digipeats the original UI frame from the “reporting station,” swapping its MYCALL for RELAY (B) and marking it (*), then repeats a frame from A and one from C, and, finally, repeats two more (from A,C and C,A) —a total of five! Note that each repeater digis five times so the total number of digipeated packets is 15!

Configuring Three Digis Using the UIFLOOD Command

Here, three digis, with MYCALLs of A, B, and C, are configured with an alias of WIDE, and UIDWAIT is set ON. For example station A’s UIFLOOD call is set as follows:

```
cmd: UIFLOOD wide,30,ID
```

The reporting station path is then set to GPS via WIDE4-4, and a UI packet is launched. Any one of the stations monitoring will then display the resulting action as follows:

```
WØXI>GPS,WIDE4-4: <UI>:5
WØXI>GPS,A*,WIDE4-3: <UI>:5
WØXI>GPS,B*,WIDE4-3: <UI>:5
WØXI>GPS,C*,WIDE4-3: <UI>:5
```

Note that all three digis see the UI frame addressed to GPS via WIDE4-4. They then, in turn digipeat that frame, inserting and marking as digipeated (*) their MYCALL, and include the new to-be-digipeated and decremented field of WIDE4-3. Note that each digi

hears the UI frames repeated by the others but does not digipeat those in turn since a timeout of 30 seconds was specified by the UIFLOOD command. See the command specification for details.

Configuring Digis Using the UITRACE Command

Here, digipeaters A, B, C, and D are set with UITRACE trace, 30. Digipeater B then launches a UI frame using GPS via TRACE4-4. The following results:

B>GPS,TRACE4-4/1<UI>:QWER
B>GPS,A*,TRACE4-3/1:<UI>:QWER
B>GPS,D*,TRACE4-3/1:<UI>:QWER
B>GPS,C*,TRACE4-3/1:<UI>:QWER

Stations A, D, and C hear B and digipeat the UI frame, inserting their MYCALL and decrementing the SSID of trace. A does not re-digipeat D or C because its “n” timer is set to 30 seconds, that is, it will not repeat any frame again within that time that includes the same source or destination and data (in this case QWER).

Bibliography

For more information on the Global Positioning System, we recommend the following resources:

General Information

Bruninga, Bob, WB4APR, “Automatic packet reporting system (APRS)”, *13th ARRL Digital Communications Conference Proceedings*, 1994. (address: ARRL, 225 Main Street, Newington, CT, 06111).

Horzepa, Stan, “Getting On Track with APRS,” ARRL (225 Main Street, Newington, CT 06111) 1996.

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Langley, R., “The mathematics of GPS”, *GPS World Magazine*, July/August 1991.

“NMEA 0183 ASCII Interface Standard”, (NMEA 0183 version 2.0), NMEA, P.O. Box 50040, Mobile, AL 36605.

GPS Device Manufacturers

Some of the more than 50 makers of GPS devices include:

- Garmin, 151st St, Olathe, KS 66062
- ICOM America, Inc., 2380 116th Ave. N.E., Bellevue, WA 98004.
- Magellan Systems Corp., 960 Overland CT., San Dimas, CA 91773.
- Sony Electronics Inc., 1 Sony Dr., Park Ridge, NJ 07656.
- Trimble - Mobile Computing Products, 645 N. Mary Ave., P.O. Box 3642, Sunnyvale, CA 94088-3642.

Other Modes of Operation

Other ways of using your TNC are covered in this section.

Some of the following modes of operation require special software, so they may not be available if you are using standard terminal programs such as HyperTerminal or Procomm Plus.

Remote Sensing and Control

You can use two (or more) packet radio stations, each containing a Kantronics TNC, to implement remote sensing and/or remote control, as follows:

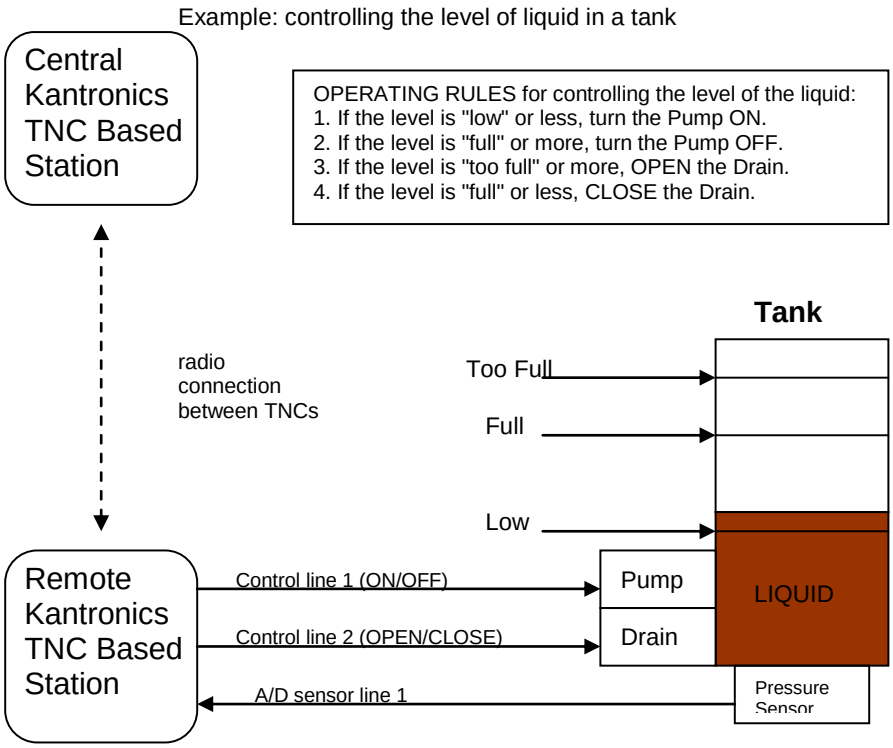
- **remote control from another TNC:** from a local Kantronics TNC-based radio station, use the assigned MYREMOTE callsign in a remote Kantronics TNC-based radio station to establish remote command access of that remote TNC and issue commands for it to carry out. For details, see the Command Reference.

- **sense analog and/or digital inputs:** use the ANALOG command to gather and report the status of one or two analog input lines in the remote MT1200. The MT1200 contain an 8 bit A/D converter and additional circuitry that converts the analog voltage presented at two specified inputs into digital values from 0 to 255 (or values dictated in the RANGE command). You can then use these digital values (also reported in binary) as an approximation of the analog voltage values at the time the TNC interrogated the analog inputs. For details on the ANALOG command, see the Command Reference.

- **control outputs:** use the CTRL command to control selected output lines in the remote TNC (up to two output lines in the MT1200). Each of these output lines can be set to OPEN (i.e., OFF) or GROUNDED (i.e., ON) by the CTRL command. Also, the CTRL command can be used with any or all of these output lines to send a specified number of short ON/OFF pulses (each pulse lasting about 100 ms, with a fixed length pause between pulses) or a single long (about 1.5 s) ON/OFF pulse. For details on the CTRL command, see the Command Reference.

You can also use the ANALOG, IO, and/or CTRL commands, from your local terminal, to carry out sensing and control functions at a local Kantronics TNC.

The following diagram illustrates the use of two Kantronics TNC/radio stations for remote control and sensing. These operations could be carried out manually or via a terminal program running in the computer in the central TNC station.



As noted earlier, the Command Reference section and the ADVANCED INSTALLATION section provide details needed to adapt these broad capacities to your own situation, with your own sensors, controls, and remote locations.

Command Reference

Introduction

This chapter documents all MT1200 commands.

There are many commands that affect operation of the MT1200. Some commands affect performance under specific conditions, some change parameters affecting general operation and others direct a one-time action.

The user changes parameters and issues instructions to the MT1200 by typing commands composed of plain-text words or abbreviations, and variables which are numbers or strings of characters chosen by the user, and then pressing ENTER. The default settings of most commands will likely never need to be changed.

Default values are stored in the EPROM section of the MT1200 microprocessor. If you change any setting or value, it will be stored automatically within a few seconds, and will be the value used at future power-on, or restart after a reset.

Format Defining Commands

The Command Line

The first line of each command definition shows the syntax for entering the command, beginning with the name of the command, followed by a listing of any parameters that may be used with the command.

The full name of each command is shown in CAPS and a “short-form” of the command is shown by the underlined characters in the name. The short-form of the command is the shortest string of characters, starting from the beginning of the full name that will allow the MT1200 to uniquely identify the command being requested.

The MT1200 scans an internal list of commands—which is NOT in alphabetical order—and selects the first match with the string you enter.

The command name is followed by a space.

After the space, there may be one or more parameters that need to be used, or that may optionally be used, with the command.

- Values that need to be entered as they are shown (or by using the short-form indicated by the underlined character(s)) are shown in CAPS , as in “ON | OFF”. Parameter names for which a value needs to be substituted are shown in lower case letters, as in “callsign,” which means a particular callsign needs to be entered.

- Lists of parameter values are enclosed in curly brackets “{ }” for grouping clarity and lists of optional parameter values are enclosed in square brackets “[ ]”.

- If more than one choice is possible for the value of a given parameter (i.e., flag), choices are separated by a vertical bar, as in “ ON | OFF” or “OPTION1 | OPTION2 | OPTION3".

- End your command entry with the ENTER key, which should send a <CTRL+M>.

If a parameter can take a range of values (or in cases such as ABAUD, any of a set of numerical values) the parameter is shown as a name in lower case (e.g., “n”) and the permissible range of values (or the list of possible values) is given in parentheses “( )” to the right side of the command, after the syntax has been presented. For example, possible values of the parameter “n” are defined as “(n = 1 - 255)”.

The Line Below the Command Definition

If commands have parameters, default values are shown on the line below the command definition.

Some MT1200 commands take effect immediately, so they are called “immediate” commands (e.g., K means “switch to CONVERSE mode"). This will be stated on the second line. For example, the command to go to CONVERS mode says “immediate” on the second line.

More Information on Commands

Each command is explained in detail and examples are given where appropriate. Following the explanation of the command, there may be a “**See also**” list that shows related commands.

Parameter Types

Almost all parameters are of one of the following types (exceptions are discussed when they are encountered in the command listing).

n (range)

Any number within the range is permissible. The unit of measure (s, ms, baud, count, etc.) for the number will be given in the description. These are decimal numbers.

n ($00 - $FF)

Special functions: Some parameters are used to control special functions, such as specifying the character to use to enter the Command mode from the Convers mode or specifying the character to use for “backslash”. Possible values and default values for these parameters are shown in HEX format.

The “digits” of a hex number represent powers of 16, analogous to the powers of 10 represented by a decimal number. The decimal numbers 10 through 15 are represented in hex by the letters A through F (e.g., decimal 10 is hex A). And a hex number is distinguished from a decimal number by preceding it with a “$” prefix.

For example:

$1B = (1*16) + 11 = 27

Number codes for these special characters are shown in hexadecimal (hex) form (i.e., base 16). They can be entered either in decimal or in hex. Permissible values are shown in HEX: for example (n = $00 - $FF).

Note: Setting a function character to zero ($00) disables that function.

➔ See the ASCII Chart at end of this manual for a listing of ASCII codes for all alphanumeric characters, including A to Z and 0 to 9, and conversions between hex and decimal representations.

Several parameters are ASCII numerical values for characters, which perform special functions. Most of these special function characters have “control characters” as default values. Control characters are entered by holding down a special control key (normally marked “Ctrl”) on the keyboard while typing the indicated key. For example, to enter a <Ctrl+X>, hold down the Control key while typing an X, then release both keys.

These special characters cannot be sent in a packet unless preceded by the pass character (see the PASS command) or unless you are operating in the Transparent Mode.

If a special character is defined as “$” then you will need to enter values in decimal, or precede the $ with the PASS character in order to enter hex numbers.

flags ChoiceA|ChoiceB

Many parameters are “flags”, meaning they have two possible values, ON and OFF, or YES and NO. All of the command descriptions show ON and OFF as the options; however YES (Y) and NO (N) may be typed instead. A few parameters are really flags, but rather than indicating that something is “on” or “off”, they select one of two ways of doing things. Some of these parameters have the values EVERY or AFTER indicating operating modes for data transmission.

The possible choices are separated by a vertical bar. Some of the flag parameters will allow many choices, such as ON|OFF|TO|FROM.

callsigns xxxxxx-n

Several commands require callsigns as parameters. While these parameters are normally Amateur callsigns, they may actually be any collection of numbers and/or

letters up to six characters; they are used to identify stations sending and receiving packets. A callsign may additionally include an “extension” (SSID, Secondary Station Identifier), which is a decimal number from 0 to 15 used to distinguish two or more stations on the air with the same Amateur call (such as a base station and a repeater). The callsign and extension are entered and displayed as call-ext, e.g. KBØNYK-3. If the extension is not entered, it is set to -0, and extensions of -0 are not displayed by the MT1200.

text

There are some commands, which have a parameter text string. This string can be any combination of letters, numbers, punctuation, or spaces up to 128 characters.

In order to be used, all string parameters must contain at least one non-space character. You can even put characters with special meanings, such as carriage return, into the string by preceding them with the PASS character. The string ends when you type a (non-passed) carriage return.

Entering Commands

To enter a command, the MT1200 needs to be in COMMAND Communication Mode (as opposed to CONVERS or TRANS communication mode).

The prompt for Command Mode is:

cmd:

➔ **Hint:** Once you go into Packet Convers Mode a <Ctrl+C> (see COMMAND) needs to be entered to return you to the Command Mode. In the Packet Transparent Mode or MODEM Mode, a special sequence is needed to return to Command Mode (see CMDTIME).

➔ **Hint:** If packets have been printing on the screen you may have forgotten which mode you are in. If you wish to see the cmd: prompt type a <Ctrl+C>, to see if you are already in Command Mode. If the prompt does not appear then you are either in Command Mode or in Transparent Mode. If you are in Command Mode, typing a Return will generate the “cmd:” prompt. If you are in Transparent Mode, you will not get the “cmd:” prompt when you press the Return key; instead, you need to enter three <Ctrl+C>s in rapid succession to switch to the Command Mode and get the “cmd:” prompt.

When you are at the Command Mode prompt, you enter a command for the MT1200 by typing the command name (in upper or lower case) and any required and optional parameter values (argument settings or values).

The command name and each parameter value must be separated from each other by at least one space.

To ENTER the command press the carriage return “CR” (usually an ENTER key). As soon as the “CR” key is pressed, the MT1200 will process the command request and take whatever action is specified (or inform you with an “EH?” if it does not understand what you have entered).

As noted above, you can enter the short-form of a command name—the characters underlined in the listing.

The short form is not necessarily the shortest unique string in the name or the first match in alphabetical order—rather it is the first match that the MT1200 will find as it scans through the ***non-alphabetical listing*** *of commands in its BIOS.*

➔ **Hint:** You can examine the value of any parameter by typing the command name followed by a “CR”. A special command, DISPLAY, allows you to see the values of all parameters or groups of related parameters.

Commands

All MT1200 commands are documented below, in alphabetical order. The underlined characters in a command's name show the short-cut version of the command. Required or optional parameters are shown after the command name, as are allowable ranges of values, where appropriate.

8BITCONV {ON | OFF}

default ON

This command was added to the first TNCs built (1980s) to accommodate terminals that would not receive (or would be confused by) 8-bit characters, only 7-bit ASCII. We've retained the command today just in case you're using such a terminal or computer. Also, it might be that your computer is capable of handling 8-bit characters but your communications terminal program will reject (or be confused or "hung") by them. In these cases, you'll need to set 8BITCONV OFF.

When ON, transmission of 8-bit data is allowed in the packet Convers Mode and Transparent Mode. If you wish to obtain 8-bit data transmission but do not want all the features of Transparent Mode, set this command to ON. If OFF, the 8th data bit is stripped (set to 0) for transmission and all data received will have the 8th bit set to 0.

ABAUD n **(n = 0,1200,2400,4800,9600,19200)**

default 0

The parameter n sets the baud used for input and output through the serial RS232 port of the MT1200 to the computer. If 0 is used, the MT1200 will run an autobaud routine upon power-up. This routine looks for an asterisk (*) character from the attached computer to set the ABAUD parameter.

If you wish to use a different baud, or to perform autobaud the next time the unit is powered up, you must change the ABAUD parameter. If you change the baud in your computer or terminal you should change the baud in the MT1200 first, then issue the RESET command, then set the new baud on your computer. Otherwise a hard reset will be required to erase the ABAUD setting and reinitialize the MT1200 to perform the autobaud routine. (See Hard Reset section.) Note also that a hard reset will erase ALL stored (changed) parameters in your MT1200 and return them to factory defaults.

See also: RESET, RESTORE

ANALOG

immediate

Entering the ANALOG command returns a string of 5 values, in the form of n/n/n/n/n.

The inputs ANA1 and ANA2 are located on pins 7 and 9 of the Telemetry jack (J6). The last three inputs (ANA3-5), are valid inputs, but have no input circuitry connected. Their samples will normally read near zero. They end at three through-hole pads near the microprocessor.

Voltages sampled at the analog inputs to the microprocessor are in the range of 0 to 3.3 volts

Each value in the returned string is a decimal number, which equates to a voltage present at each numbered analog input.

The range of decimal numbers that will be displayed is determined by the setting of the command RANGE

Analog input data can be gathered from a remote site by connecting to MYREMOTE and then issuing the ANALOG command.

Any or all of the analog input readings can be included in the transmitted GPS beacon, and/or in the TELEMETRY beacon.

See also: GTEXT, MYREMOTE, RANGE, TELTEXT

APRSMSG [n] [INPUTS] (n = 0 - 7)

default 0

Sets message type (0-7) or use I/O inputs (INPUTS) to set message type. The three digital inputs can be toggled (binary) to select type.

APRSSYMB

default />

Sets APRS symbol displayed on maps from this units transmitted position.

AUTOLF {ON | OFF}

default ON

When ON, a line feed is sent to the terminal after each carriage return. This parameter should be set on when overprinting occurs and the terminal being used does not

automatically supply its own linefeed after a carriage return. This command affects only the data sent to the terminal, not data sent to the radio.

See also: CR, LFADD

AX25L2V2 {ON | OFF}

default ON

This command provides compatibility with all known packet units implementing AX.25 protocol. When ON, Level 2 Version 2 protocol is implemented and the TNC will automatically adapt to whichever version the connecting station is using. When OFF, Level 2 Version 1 is implemented. Set this command to OFF if you need to digipeat through other units, which do not digipeat version 2 packets. You may also find benefit from setting this command OFF when using several digipeaters (not nodes) to send packets, or when conditions are marginal between the two stations involved. (NOTE: Changing this setting after connecting to another station will have no effect on the current connection.)

The major difference in V1 and V2 protocol is the method used to handle retries. In the connected mode, if a packet is sent and not acknowledged, Version 1 will re-send the entire packet and then disconnect if the RETRY count is reached. Version 2 will first send a poll, the response to this poll will determine if the packet was received. It is possible that the ack was collided with and therefore the data packet does not need to be resent. If the ACK shows that the data packet was not received, it will be re-transmitted. Each time a poll is answered the TRIES count is reset to 0. If the RETRY count is reached, version 2 will attempt to re-connect unless RELINK is OFF. If the re-connect attempt is unsuccessful, then version 2 will issue a disconnect.

See also: RELINK, RETRY, TRIES

For more information, see the book *AX.25 Amateur Packet-Radio Link-Layer Protocol Version 2.0 October 1984*, which can be obtained from the ARRL.

AXDELAY n **(n = 0 – 255)**

default 0

The value of “n” is the number of 10 millisecond intervals to wait, in addition to TXDELAY, after keying the transmitter before data is sent. This delay can be helpful when operating packet through a standard “voice” repeater, or when using an external linear amplifier which requires extra key-up time. Repeaters using slow mechanical relays, split-sites, or both require some amount of time to get RF on the air.

See also: AXHANG

AXHANG n **(n = 0 - 255)**

default 0

Each increment specifies 10 millisecond intervals. This value may be used to improve channel utilization when audio repeaters with a hang time greater than 10 ms are used. If the repeater squelch tail is long, it is not necessary to wait for AXDELAY after keying the transmitter if the repeater is still transmitting. If the TNC has heard a packet within the AXHANG period, it will not add AXDELAY to the key-up time.

See also: AXDELAY

BEACON [EVERY | AFTER] n **(n = 0 - 255)**

default Every 0

The value entered for “n” is the number of minutes (i.e., one-minute intervals) to use with the beacon command.

A value of 0 turns the beacon OFF. Setting a value greater than 0 activates the beacon under the conditions specified.

If the optional keyword Every is used, a beacon packet will be sent every n minutes. If After is used, a beacon packet will be sent ONCE after the specified interval with no channel activity.

The beacon frame consists of the text specified by BTEXT in a packet addressed to “BEACON”. Beacon messages will be digipeated via any addresses specified in the UNPROTO command.

See also: BTEXT, BPATH,

BKONDEL {ON | OFF}

default ON

When ON, the sequence backspace-space-backspace is sent to the attached terminal when the DELETE character is entered. When OFF, the backslash character “\\” is sent to the terminal when the DELETE character is entered.

See also: DELETE, REDISPLAY

BPATH {DEST [VIA call1],call2],call3],call4]}

default BEACON

This command establishes the destination address of beacon packets, and specifies any digipeaters to use (up to a total of 4 digipeaters).

DEST = destination address (this is really just a “dummy” address, as no connection takes place, people often put their name or CQ here)

VIA call1 - call4 = optional stations to be digipeated through. A maximum of 4 digipeat addresses (callsigns or aliases) can be specified. This is referred to as a path.

Each callsign may also have an optional Secondary Station Identifier (SSID) specified as -n, where n = 1 - 15. The digipeat callsigns are specified in the order in which they are to relay transmitted packets.

See also: BEACON

BREAK {ON | OFF}

default OFF

If BREAK is ON, a modem break sent from the terminal causes a return to Command Mode from Converse or Transparent Mode.

See also: COMMAND

BTEXT text (0 - 128 characters)

default (blank)

BTEXT specifies the content of the data portion of the beacon packet. Any combination of characters and spaces may be used with a maximum length of 128.

Entering a single “%” will clear BTEXT.

See also: BEACON

BUDLIST [ON|OFF] [NONE | {+|-}call | call1,call2,...]

where call={callsign | {<|>}callsign | callsign{>|<>}callsign}

default OFF NONE

BUDLIST is used to determine which received packets will be monitored. When OFF or NONE, BUDLIST will allow monitoring of all packets, even if it has callsigns in its list.

The maximum number of callsigns allowed in BUDLIST is 10. Up to 10 callsigns may be entered at once, using the format shown after the command name, and the new list of from 1 to 10 callsigns will replace whatever list was there before. The BUDLIST command can be used to add a single callsign (+callsign), so long as there is room for the new callsign on the list (if there is not, the TNC responds with “EH?” and returns you to the command prompt). Similarly, you can remove a single callsign (-callsign) from the list. And to remove all items from the current list, enter BUDLIST NONE.

A callsign entered without a SSID will match any SSID of that callsign. To match a specific SSID only, enter the callsign with that SSID: for example, callsign-n, where n = 0-15.

More selective monitoring is enabled when a callsign or two callsigns is combined with a “>” and/or a “<” character. For example, entering “>callsign” will enable monitoring of packets TO that callsign (assuming BUDLIST is ON), entering “<callsign” will enable monitoring of packets from the callsign, entering “callsign1>callsign2" will enable monitoring of packets from callsign1 to callsign2, and entering ”callsign1<>callsign2" will enable monitoring of packets from callsign1 to callsign2 and vice versa.

➔ Note that entering callsign1>callsign2 or callsign1<>callsign2 counts as two of the 10 maximum allowed callsigns.

CALIBRAT

immediate

The CALIBRATE command can be used to generate a signal which may be used as an aid in adjusting transmit audio drive level to your transceiver, or can be used to detemine whether an equalization adjustment is required.

The use of this command is explained in the Calibration/Equalization Section. This function can be used while the internal GPS is enabled. The command GPS must be set to OFF before entering Calibrate mode.

See also: XMITLVL, Calibration/Equalization section

CANLINE n **(n = $00 - $FF)**

default $18 <Ctrl+X>

This command is used to change the cancel-line input editing command character. When in Convers or Command Mode entering a <Ctrl+X> will cancel all characters input from the keyboard back to the last un-PASSed carriage return (unless PACTIME has expired, CPACTIME is turned on, and you are in Convers Mode).

See also: CANPAC, CPACTIME, PASS

CANPAC n **(n = $00 - $FF)**

default $19 <Ctrl+Y>

This command is used to change the cancel-packet command character. When in the Convers Mode entering a <Ctrl+Y> will cancel all keyboard input back to the last unpassed SENDPAC character (unless PACTIME has expired and CPACTIME is turned on).

This character also functions as a cancel-output character in Command Mode. Typing the cancel-output character a second time re-enables normal output. For example, if you've told the TNC to do a DISPLAY, a <Ctrl+Y> will cancel the display and a second one re-enables the cmd: prompt after the next "CR".

See also: CANLINE, CPACTIME, SENDPAC

CD {INTERNAL | EXTERNAL | SOFTWARE}

default INTERNAL

The CD command selects which carrier detect method will be used.

When set to INTERNAL, the TNC will detect a signal present on the channel, using an energy type carrier detect, allowing shared voice and data on the same channel. Any receive audio will trigger carrier detect.

When set to EXTERNAL, a signal is supplied by an external device, through the XCD pin on the radio port, to indicate that a receive signal is present.

If set to SOFTWARE, the firmware inside the TNC will detect the presence of received packet data to enable the carrier detection, allowing operation with un-squelched audio. Correct operation of SOFTWARE carrier detect is affected by proper equalization and the SWP parameter. If your RCV light flickers while receiving a packet, this is an indication that you may need to adjust the equalization. (Equalization is set with an internal jumper.)

When CD is set to INTERNAL or SOFTWARE, the external carrier detect pin on the radio connector (if wired) can be used to hold off the TNC from keying the radio.

See also: CDINVERT, SWP, XCDENA

CDINVERT {ON | OFF}

default OFF

Sets the sense of the XCD input. When set to OFF, a low input (near ground) is expected to indicate a busy channel. When set to ON, expects a high (above 2 volts) to indicate a busy channel.

See also: CD, XCDENA

CHECK n **(n = 0 - 255)**

default 0

The value entered for “n” is the number of 10 second intervals to wait during “no activity” before making a periodic check (poll) to determine that a connected state still exists.

This “timeout” command is used to prevent a “hang-up” in a connected mode when a link failure occurs as a result of conditions beyond control of the connected stations.

If n equals 0, this “timeout” function is disabled. While using Version 1 (AX25L2V2 OFF), a check timeout will initiate a disconnect.

See also: AX25L2V2, RELINK, RNRTIME

CHFREE [EVERY] [[hh:]mm:]ss START [[hh:]mm:]ss [FOR [[hh:]mm:]ss]

default Every 00:00:00

When a time is entered, defines a “window” of time when any transmissions are allowed.

The START option sets a time to begin the “window”, and the FOR option sets a duration after START to leave the “window” open.

Outside of the specified “window” of time, no transmissions are allowed.

CMDTIME n **(n = 0 - 15)**

default 1

This command sets the time allowed for entry of required characters to exit the Transparent Mode (or LINESUB, MODEM, or TUP modes). In order to allow exit to Command Mode from Transparent Mode, while permitting any character to be sent as data, a guard time of CMDTIME seconds is set up.

Entering a value for “n” sets the value of CMDTIME to “n seconds”.

To exit Transparent mode, you need to wait at least CMDTIME since the last data character was sent to the MT1200. Then you need to enter the COMMAND character (e.g., <Ctrl+C>)) three times, with a wait of LESS THAN the value of CMDTIME between the first and second time you enter the COMMAND character and also a wait of LESS THAN the value of CMDTIME between the second and third time you enter the COMMAND character.

After a final delay of CMDTIME the TNC will exit Transparent Mode and enter Command Mode. At this time you should see the cmd: prompt. If CMDTIME is set to zero, the only exit from Transparent Mode is a modem break signal, assuming BREAK is set to ON.

For example (if CMDTIME is 1 second and COMMAND is <Ctrl+C>): wait one second, type a <Ctrl+C>, within one second type a second <Ctrl+C>, within one second type a third <Ctrl+C>, WAIT one second, cmd: prompt should appear. If your computer/program has the capability you can also send a modem break to escape Transparent Mode.

See also: COMMAND, TRANS, BREAK

CMSG {ON | OFF | DISC}

default OFF

When OFF, the custom connect text stored in CTEXT will not be sent to the connecting station upon receiving a connect request. When ON, the custom CTEXT string will be sent. When CMSG is set to DISC, the custom CTEXT string will be sent to the connecting station, and then your TNC will disconnect from that station.

See also: CTEXT

COMMAND n **(n = $00 - $FF)**

default $03 <Ctrl+C>

This command is used to change the Command Mode entry character. When COMMAND is set to the default value, typing a <Ctrl+C> causes the TNC to return to Command Mode from packet Convers Mode. See CMDTIME for returning to Command Mode from Transparent Mode.

CONLIST [ON | OFF] [NONE | {+|-}callsign | callsign1,callsign2...]

default OFF

CONLIST is used to determine which stations (callsigns) may use your station for ANY purpose, including digipeating.. When ON, the TNC will recognize only those packets

received with a callsign that appears in the CONLIST's list of callsigns; and you will not be able to connect to any station that is not in the conlist. When OFF, the TNC will process all packets.

The maximum number of callsigns allowed in CONLIST is 10. Up to 10 callsigns may be entered at once, using the format shown after the command name, and the new list of from 1 to 10 callsigns will replace whatever list was there before. The CONLIST command can be used to add a single callsign (+callsign), so long as there is room for the new callsign on the list (if there is not, the TNC responds with "EH?" and returns you to the command prompt). Similarly, you can remove a single callsign (-callsign) from the list. And to remove all items from the current list, enter CONLIST NONE.

A callsign entered without a SSID will match any SSID of that callsign. To match a specific SSID only, enter the callsign with that SSID: for example, callsign-n, where n = 0-15.

CONMODE {CONVERS | TRANS}

default CONVERS

This command controls the mode the TNC will be placed in AUTOMATICALLY after a connect if NOMODE is OFF. The connect may result either from a connect request received or a connect request originated by a CONNECT command. If the TNC is already in Convers or Transparent Mode when the connection is completed, the mode will not be changed. If you have typed part of a command line when the connection is completed, the mode change will not take place until you complete the command or cancel the line input.

See also: CANLINE, CONNECT, CONVERS, NOMODE, TRANS

CONNECT call1 [VIA call2,call3,...,call9]

immediate

call1 = callsign of station to be connected to.

call2,...,call9 = optional stations to be digipeated through. A maximum of 8 digipeater addresses (callsigns or aliases) can be specified. This is referred to as a path.

Each callsign may also have an optional Secondary Station Identifier (SSID) specified as -n, where n = 1 - 15. The digipeat callsigns are specified in the order in which they are to relay transmitted packets. The mode set by CONMODE will be entered upon successful connect, if NOMODE is OFF. If no response to the Connect request occurs after RETRY attempts, the command is aborted. A timeout message is printed on the display and the TNC remains in the Command Mode. The station being connected to (call1) may receive the connect request but be unable to accept connects, in which case

a busy message will be printed to the screen and the TNC will stay in Command Mode. Connect requests may only be initiated in the Command mode.

If a connect is in progress, or already established, the path may be changed by simply re-issuing the CONNECT command with the desired path. This must be done in command mode.

CAUTION, packets en route between your station and the reconnected station may be lost.

If CONNECT is entered with no parameters, the current connect status is displayed.

See also: CONMODE, CONOK, DBLDISC, NOMODE, RETRY, RING, XMITOK

CONOK {ON | OFF}

default ON

When ON, connect requests from other TNCs will be automatically acknowledged and a <UA> packet will be sent. The standard connect message will be output to the terminal and the mode specified by CONMODE will be entered if you are not connected to another station and NOMODE is OFF.

When OFF, connect requests from other TNCs will not be acknowledged and a <DM> packet will be sent to the requesting station. The message “connect request: (callsign of whoever is trying to connect to you)” will be output to your terminal if INTFACE is TERMINAL or NEWUSER.

See also: CONMODE, CONNECT, INTFACE, MONITOR, NOMODE

CONVERS

immediate

CONVERS has no options. It is an immediate command and will cause entry into Conversational Mode from Command Mode. Any link connections are not affected.

➔ Hint: **K** is the same as CONVERS, for quicker entry.

See also: K, COMMAND

CPACTIME {ON | OFF}

default OFF

When OFF and in the Convers Mode, packets are sent when the SENDPAC character is entered or when PACLEN is achieved. When ON and in the Convers Mode, packets are sent at periodic intervals determined by PACTIME. Characters are sent periodically as in Transparent Mode but the local editing and echoing features of Convers Mode are enabled.

See also: CONVERS, CR, PACLEN, PACTIME, SENDPAC, TRANS

CR {ON | OFF}

default ON

When ON the SENDPAC character (normally carriage return) is appended to all packets sent in Convers Mode except when PACLEN is exceeded. Setting CR ON and SENDPAC $0D results in a natural conversation mode. Each line is sent when a “CR” is entered and arrives at its destination with the “CR” appended to the end of the line. To avoid overprinting, AUTOLF may need to be ON at the receiving end.

See also: AUTOLF, LFADD, SENDPAC

CRSUP {ON | OFF}

default OFF

This command was added to the first multi-mode TNCs (such as the Kantronics UTU and KAM) to accommodate the practice by radio teletype (RTTY) operators of adding an extra carriage return (CR) at the end of each line (i.e., CR, CR, linefeed (LF)). This was done to give the carriage of the old mechanical teletypes time to return across the page. Some of these machines are still in use, so we’ve retained this command so you can “correct” the data you might receive from such a station. To do so, turn CRSUP ON. When ON, this command suppresses every other carriage return (when no data is between them) in the received data before sending the data to the terminal. When CRSUP is OFF, all carriage return characters are left in the received data as it is sent to the terminal.

See also: AUTOLF, LFSUP

CSTAMP {ON | OFF}

default OFF

When ON, the daytime stamp is printed with all "*** CONNECTED TO" and "*** DISCONNECTED" messages on the terminal.

See also: CONNECT, DAYTIME, DISCONNECT, MSTAMP

CTEXT text **(0 - 128 characters)**

default (blank)

Enter any combination of characters and spaces up to maximum length of 128. Entering a single '%' will clear CTEXT. This entry specifies the text of the first packet to be sent in response to an accepted connect request provided that the parameter CMSG is not OFF.

See also: CMSG, CONNECT

CTRL {A | B} { OFF | ON | LONG | n} **(n=1-20)**

immediate

This command causes the MT1200 to activate (or deactivate) the specified output line (A or B) to the radio port as indicated. If A or B output is not specified, both outputs are affected. For instance, to pulse the A output (CTLA on the schematic) 3 times, you would give the command "CTRL A 3". You may optionally specify the number of times to pulse the output (n), or to turn the output ON, or OFF. Each pulse on the output line lasts approximately 100 ms (0.1 s). Specifying LONG results in one pulse of the output line, lasting approximately 1.5 s. These output lines are open drain outputs and are pulled to ground when active. For more information, see the section on "Connecting to your Radio" in this manual.

Do not allow more than 200 mA of current in this circuit.

CWID [{EVERY | AFTER}] n **(n = 0 - 255)**

default EVERY 0

Each increment specifies 1-minute intervals. A value of 0 turns the ID OFF. Setting a value greater than 0 activates the ID under the conditions specified. If the optional keyword "Every" is used, an ID will be sent every n minutes. If set to "After", an ID will be sent ONCE after the specified interval with no channel activity.

The string specified by the CWIDTEXT command will be sent in Morse Code, using AFSK tones.

Some countries require all stations to ID in Morse code periodically.

See also: MYCALLl, CWIDTEXT

CWIDTEXT text **(0-15 characters)**

default DE mycall

This command sets the text to be transmitted when the MT1200 performs an automatic CWID. The text will be transmitted periodically as set by the CWID command.

See also: CWID

DAYSTR text

default yyyy-mm-dd hh:mm:ss

The DAYSTR command is used to set the FORMAT of your date/time display. DO NOT enter an actual date or time, simply enter the form of the display you would like, using the lower case letters m, d, h, y, and s as described below.

The format you enter is used for displayed time stamps.

The lower case characters m, d, y, h, and s have special meaning to this command and will be replaced with data from the software clock. The lower case m will be replaced with the minutes the first time it appears after a lower case h. If h, m, y, d, or s is specified as a single character, the corresponding date/time element will be displayed as a single digit if the value is less than 10. Entering two characters will force a two digit display for values under 10. If the month is entered as three ms, it will be displayed as the first three characters of the month name (JUL). You may also enter any other text you wish, allowing you to add such things as your time zone.

➔ Remember ALL lower case m, d, y, h, and s will be replaced by actual values.

Some examples of setting the DAYSTR command and the resulting time/date display are:

DAYSTR setting	Displayed Date/Time
mm/dd/yy hh:mm:ss	07/16/02 12:14:22
d.m.y h:mm:ss	16.7.02 12:14:22
d.mm.yy h:mm	16.07.02 12:14
mmm d 20yy h:mm CST	JUL 7 2002 12:14 CST
TIME hh:mm DATE: mmm dd, 20yy	TIME 12:14 DATE JUL 07, 2002

➔ The DAYSTR command is used to define how date and time are to be displayed; it is not used to enter an actual date and time (which you do by using DAYTIME). If you enter an actual date and time with the DAYSTR command, your clock will appear to stop.

See also: DAYTIME

DAYTIME yyyy-mm-dd hh:mm:[ss]

DAYTIME is used to enter a date and time (after which time and date are formatted for display by the specifications given in DAYSTR).

When date and time are entered, using the input format specified in the command and explained below, the values entered are used to set the software clock/calendar. The software clock/calendar is then used for MHEARD logging, as well as for CSTAMP and MSTAMP functions.

When entering the daytime digits, enter them in the specified default sequence. Notice that there are four digits for the year, then two digits each for month, day, hours, minutes, and (optionally) seconds. Also, notice that you need to use the order given here, which has nothing to do with the format (given in DATSTR) for displaying date and time values. For example, to enter 2006, December 1, at 14:30:00 hours, the value of the DAYTIME parameter would be 2006-12-01 14:30:00

If DAYTIME is entered with no parameter, the daytime is displayed using the format defined by the DAYSTR command.

➔ **Hint:** If the time appears to be stuck, check the current value of DAYSTR, to be sure that the DAYSTR setting is being used to format the display of time and date, and not (in error) to attempt to supply an actual date and time. If this is not the case, fix the problem and see if time and date displays work correctly.

If the MT1200 was ordered with the internal GPS installed, the Daytime will automatically be set based on GPS time, upon valid GPS fix.

See also: CSTAMP, DAYTWEAK, DAYSTR, MHEARD, MSTAMP

DAYTWEAK n **(n = 0 - 15)**

default 8

This parameter is used to adjust the software clock, if needed, for accurate time keeping. Increasing the parameter will slow the clock, decreasing the parameter will speed up the clock. Each count corresponds to 0.64 s increase or decrease per 24 h. Ambient temperature will affect the clock to some degree.

The software clock stops when a soft reset or powering off occurs, and upon power on the software clock restarts.

DAYZONE n **(n = -12 to +12)**

default 0

This parameter is used to adjust the display of time, in relation to GPS time. If your displayed time is UTC, there will be a difference from GPS time. Enter the difference to correct the UTC display.

DBLDISC {ON | OFF}

default OFF

When OFF, only one disconnect command (D) need be given to terminate an unsuccessful connect attempt. If you are actually connected, the normal disconnect sequence will occur.

When ON, a normal disconnect sequence will always occur (you will not be disconnected until you receive an acknowledge of your disconnect or until the retry count is exceeded). A second D is required to force a local disconnect independent of the retry counter.

See also: DISCONNECT

DELETE n **(n = $00 - $FF)**

default $08 <Ctrl+H>

This command sets the character to be used as the delete character. When this character is typed, the last input character is deleted. The most common settings are $08 (backspace) and $7F (delete).

See also: BKONDEL

DIGIPEAT {ON | OFF | UIONLY}

default ON

When ON, any packet received that has MYCALL, or MYALIAS, in the digipeat list of its address field will be retransmitted. Each station included in the digipeat list relays the packet in the order specified in the address field. Digipeating takes place concurrently with other TNC operations and does not interfere with normal connected operation of the station. To disable digipeat operations (via MYCALL, or MYALIAS), set this command to OFF.

If UIONLY is selected, the MT1200 will digipeat UI frames only. Connect type packets will be ignored.

See also: HID, MYALIAS, MYCALL

DISCONNE [MYREM]

immediate

When given without options, “disconnect” will initiate an immediate disconnect request. A successful disconnect results in the display of “*** DISCONNECTED”. If the RETRY count is exceeded while waiting for the connected station to acknowledge, the MT1200 moves to the disconnected state. Entering a second Disconnect command before RETRY has expired will result in an immediate disconnect on your end, but may leave the other station thinking it is still connected to you. Disconnect messages are not displayed when the TNC is in Transparent Mode. Other commands may be entered while the disconnect is in progress.

DISCONNE MYREM

Issue this command if you want to cause the remote access to issue a disconnect to the user connected to the MYREMOTE callsign.

DISPLAY { A | C | G | I | L | M | T }

immediate

This command causes the TNC to display a list of all the parameters in the TNC. You may also display only a selected group of parameters by specifying the appropriate class identifier for that group. When using the DISPLAY command with a subclass be sure to use a space between the DISPLAY command and the subclass. Subclasses of related parameters are:

ASYNC	asynchronous port parameters (TNC to computer)
CHAR	special TNC characters
GPS	parameters related to GPS operations

ID	ID parameters
LINK	parameters affecting packet link (TNC to TNC)
MONITOR	monitor parameters
TIMING	timing parameters

Individual parameter values can be displayed by entering DISPLAY and the command name, followed by “CR”.

See also: Display Listings section

DWAIT n **(n = 0 - 255)**

default 0

DWAIT defines a delay to be used to avoid collisions with digipeated packets. The value entered for “n” is the number of 10 ms intervals, after last hearing data on the channel, for the MT1200 to wait before it begins its own key-up sequence.

This value should be established and agreed on by all members of a local area network. The best value will be determined by experimentation but will be a function of the key-up time (TXDELAY). This feature is made available to help alleviate the drastic reduction of throughput, which occurs on a channel when digipeated packets suffer collisions. Digipeated packets are not retried by the digipeater but must be restarted by the originating station. If all stations specify DWAIT, and the right value is chosen, the digipeater will capture the frequency every time it has data to send since digipeated packets are sent without this delay.

Observations have proven that a better algorithm for avoiding collisions between end-user stations, while still allowing digipeaters the high-priority access they require is achieved using Persistence and Slottime to determine proper transmit intervals, and setting DWAIT to 0.

See also: PERSIST, SLOTTIME

ECHO {ON | OFF}

default ON

When ON, characters received from the computer by the TNC are echoed back and displayed. If you are receiving double print of characters entered at the keyboard, turn this command OFF. This corresponds to the setting in your terminal program for duplex. If your program is set for full-duplex set ECHO ON. If your program is set for half-duplex (some call it echo) then set ECHO in the TNC to OFF. Regardless of the setting of this command, the TNC will not echo an X-OFF or X-ON character to the terminal when it receives a STOP or START character. Echo is disabled in Transparent Mode.

See also: BKONDEL, FLOW

ESCAPE {ON | OFF}

default OFF

This command specifies the character, which will be sent to the terminal when an escape character ($1B) is received in a packet. When OFF, $1B is sent. This is useful if your terminal interprets ESC characters as screen positioning commands (ANSI). When ON, the escape character is sent as a dollar sign ($).

FILTER {ON | OFF}

default OFF

When ON, this command will inhibit the printing of control characters (hex $00 - $1F) which may be present in monitored packets. This will be useful if you are monitoring channel traffic, which includes binary file transfers, or higher level protocols (networks talking to each other). Control characters, which may be embedded in those packets, can have strange and unpredictable effects on the monitoring TNC. All control characters except carriage return ($0D) and line feed ($0A) will be filtered. This command DOES NOT affect receipt of control characters in packets received from a "connected" station when MONITOR or MCON is OFF.

See also: MONITOR

FLOW {ON | OFF}

default ON

When FLOW is ON, any character entered from the terminal will halt output to the terminal until the current packet or command is completed (by SENDPAC, PACLEN, or PACTIME). Canceling the current input to the TNC or typing the REDISPLAY-line character will also cause output to resume. FLOW will keep the display of received data from interfering with data entry.

When FLOW is OFF, received data will be "interleaved" with keyboard entry. If using a split screen terminal program, you should have FLOW OFF and ECHO OFF to allow received data to be displayed while you type into the TNC's type-ahead buffer.

See also: CANLINE, CANPAC, CPACTIME, ECHO, PACLEN, REDISPLAY, SENDPAC

FRACK n **(n = 1 - 15)**

default 4

Each increment specifies 1-second intervals. After transmitting a packet requiring acknowledgment, the TNC waits FRACK seconds before incrementing the retry counter

and sending the packet again. If the retry count (specified by the RETRY command) is exceeded, the current operation is aborted. If the packet address includes digipeaters, the time between retries is adjusted to FRACK * ((2 * m) + 1) where m is the number of digipeater stations specified. When the retried packet is sent, a random wait time is also added to avoid lockups where two units repeatedly collide with each other.

The FRACK timer begins when PTT is released (the packet has been sent) and is suspended when data carrier from the radio is present, or when your station is transmitting.

See also: CONNECT, RESPTIME, RETRY

GBEACON {[+] [[EVERY] [[hh:]mm:]ss] [IDLE [[hh:]mm:]ss] [APPEND] [CLEAR] [PROP] [DISTANCE d [METERS | YARDS]] [CORNER d [ABOVE v [KPH | KNOTS | MPH]]]} | {[EVERY] [[hh:]mm:]ss START [[hh:]mm:]ss [APPEND] [CLEAR]}

default EVERY 00:00:00

This command sets the interval between GPS beacons.

If EVERY is specified, the beacon will be transmitted at the interval specified by the hh:mm:ss parameter. This is set in hours:minutes:seconds.

If the optional key word START is given followed by a time (in 24 h format), the beacon will not be transmitted until the specified time. The beacon will then be transmitted according to the setting of the EVERY parameter. When using the START option, the following beacon interval modifiers are disallowed.

(NOTE: If the current time is past the start time, the beacon will start at the next scheduled interval based on the start time.)

If the option PROP (APRS proportional) is specified, GPS beacons are sent at the fixed interval specified by GBEACON EVERY xx:xx:xx, but the digipath is empty for every other packet (say, at odd intervals). At even intervals, packets are sent with the WIDE digi option. The first one is sent VIA WIDE1-1. Every other one of those is sent VIA WIDE1-1,WIDE2-1. Every other one of those is sent via WIDE1-1,WIDE2-2. Using the PROP option supercedes the GPATH digi entries. When using Proportional beaconing, the beacon-rate modifiers (DISTANCE, and CORNER) can not be used.

If the option APPEND is included, and the PTT line between the microphone and radio is also connected to pin 7 on the MT1200 radio port, a GPS beacon will be transmitted upon release of the microphone PTT.

If the option CLEAR is included, the GPS buffer is cleared after transmission. This way no copies of an invalid NMEA string are transmitted.

If the option DISTANCE is included with a specified distance value in meters or yards, a GPS beacon is transmitted after that distance of travel.

If the option CORNER is included with specified degrees of direction, a GPS beacon is transmitted after the specified amount of change. A velocity modifier can also be included, that will cause the beacon to be transmitted when turning a corner above the specified velocity.

GCOMPRESS {NONE | COMPRESS | SUPER | MICE}

default NONE

Sets the amount of data compression of the transmitted packet and/;or GPS data.

COMPRESS and SUPER select the amount of compression of the complete transmitted packet (packet header and data). Only other MT1200 units set with the same amount of compression will be able to decode and display these packets

MICE is the MIC-E compression used in APRS systems. Using the MICE option compresses the GPS position information in the data part of a transmitted GPS beacon. This setting supercedes the setting in GTEXT for transmitted packets, but does not affect LOCATION or GREPORT data that is output through the MT1200 serial port to the terminal. It also supercedes the destination address setting in GPATH for GPS beacons, but does not affect the digi path in GPATH.

See also: LOCATION, GPATH, GREPORT, GTEXT

GPATH {DEST [VIA call1],call2],call3],call4]}

default GPS

This command establishes the destination address of GPS beacon packets, and specifies any digipeaters to use.

DEST = destination address. This is where the code is placed, to cause APRS map programs to display a specific icon for you. A listing of the icon codes can be found on the APRS.org web site.

VIA call1 - call4 = optional stations to be digipeated through. A maximum of 4 digipeat addresses (callsigns or aliases) can be specified. This is referred to as a path.

Each callsign may also have an optional Secondary Station Identifier (SSID) specified as -n, where n = 1 - 15. The digipeat callsigns are specified in the order in which they are to relay transmitted packets.

See also: GBEACON

GPS OFF | ON

default OFF

This command is used to enable/disable the internal GPS module in the MT1200G.

Note: this command is not available in the MT1200.

GSAVE n |GBEACON (n = 0 – 60 s)

default 0

This command sets an interval, at which to save a copy of GPS data in the GPS data log.

If it is to a number, the GPS data is saved at that specific interval.

If it is set to GBEACON, a copy of the GPS data in each GPS beacon transmission is stored in the GPS log.

Note: this command is not available in some units.

See also: GBEACON

GTEXT var[var][var]…

default (blank)

This command determines which variable(s) and/or other text, that will be transmitted in a GPS beacon, or displayed in GREPORT. Each of these variable to be included in the transmitted string are to be bracketed by $ characters.

The GTEXT entry can contain up to a total of 127 characters. Note, that the transmitted string, if including NMEA sentences, will be longer than your entry.

The available variables are:

GGA, GLL, RMC, VTG, LAT, LONG, UTC, OFFSET, DATE, ALT, ESPD, NSPD, USPD, SOG, TRACK, NUMSAT, TEMP, VOLT, ANAn, IOn, CHKSUM

GGA,GLL,RMC, and VTG equate to standard NMEA sentences, and will be displayed as $GPGGA,$GPGLL,$GPRMC, or $GPVTG headed strings. CHKSUM is a calculated checksum of the NMEA string.

LAT and LONG equate to current latitude and longitude. UTC, OFFSET, and DATE, equate to current time in UTC and the GPStime offset, and current date.

ALT equates to current altitude above sea level. ESPD, NSPD, USPD, and SOG equate to speed in easterly, northerly, and upward directions, and speed over ground.

TRACK equates to the current vector (direction of travel). NUMSAT indicates the number of GPS satelite signals were used in the last postion calculation.

TEMP and VOLT equate to the interior temperature and power supply voltage.

ANAn, with a number (1 – 5) is the decimal number (as defined by RANGE) equating to the voltage level input to that numbered analog input.

IOn, with a number (1 – 8) displays the logic level of the numbered IO line.

Text and numbers can be entered directly into the string (when not placed inside $ characters).

Formating characters (such as carriage return, line feed, etc.) can be entered in the string (when not placed inside $ characters), by preceding each character with the PASS character.

See also: ANALOG, GBEACON, GPATH, GUNITS, IO, LOCATION, PASS

GUNITS ENGLISH | METRIC | KNOTS

default (ENGLISH)

Sets the display of units for temperature,velocity and altitude.

HEADERLN {ON | OFF}

default ON

When ON a carriage return is output to the terminal between the header and text of monitored packets. This causes the packet header and time stamp (if on) to be displayed on one line, with the packet text displayed below it on the next line. When receiving packets addressed only to you (MONITOR and/or MCON OFF) this parameter does not apply. When OFF the data will be on the same line as the header.

See also: CSTAMP, MCON, MONITOR, MSTAMP

HELP [command]

immediate

Entering the word “HELP” alone, without any argument, will generate a display listing all commands available in the MT1200.

When the name of a command is entered also (e.g., HELP CONVERS), a brief description of that command will be displayed.

HELP can also be called by entering “?”.

HID {ON | OFF}

default ON

When ON, an ID packet will be sent every 9.5 minutes, provided that packets are being transmitted from or digipeated through your station. This command should be ON if digipeating is enabled, and using an alias name (in MYALIAS) for the digiperater. If set to OFF, periodic identification packets will not be sent.

See also: DIGIPEAT, ID, MYALIAS

ID

immediate

When this command is entered an identification packet will be transmitted. This command may be used to insure that your station identification is the last transmission before taking the station off the air.

The ID packet is an unnumbered information <UI> packet whose data consists of your station identification as set in MYCALL and digipeater calllsign if the the command DIGIPEAT is set to ON.

The MYCALL will be appended with “/R” if DIGIPEAT is ON, MYALIAS callsign appended with “/D”. This packet will be addressed to “ID” and digipeated via any addresses specified in the UNPROTO command.

See also: HID, UNPROTO

IGNITION {ON | OFF}

default OFF

When set to ON, the MT1200 will not power on unless the IGNITION input is active. The Ignition input is the middle pin of the Power Jack. It should be connected to a line in the vehical that is active (has voltage) when the Ignition of the vehicle is ON.

INTFACE {TERMINAL|KISS|XKISS|LINESUB|MODEM|(GPS)}

default TERMINAL

When set to TERMINAL, the full command set of the TNC is available.

When INTFACE is set to KISS mode of operation, users interact with the TNC using software that implements the KISS code specified by Phil Karn (for more information, see the KISS Operation section of this manual).

When INTFACE is set to XKISS mode of operation, users interact with the G8BPQ extended KISS protocol (for more information, see the KISS Operation section of this manual).

When INTFACE is set to LINESUB mode, the MT1200 becomes a transparent modem device. Data input to the serial port is transmitted in a simple frame of data with checksum. LINESUB data received through the radio port is passed out the serial port. (see the LINESUB mode section of this manual).

When INTFACE is set to MODEM, the MT1200 mirrors at the RS232 port @ 1200 baud what it receives at the radio port (for more information, see the “modem mode” in the Modes of Operation chapter). Note that ABAUD must also be set to 1200 baud.

When INTFACE is set to GPS, the MT1200 will enter GPS mode upon power up. Data from the serial port will be parsed according to the GTEXT command, that text will be stored in the LOCATION buffer, and beacons will be transmitted according to the setting of the GBEACON command. This function is not available in the MT1200G.

For instructions on exiting KISS, XKISS, LINESUB, MODEM, POLL, and TUP modes, see the appropriate sections of the “modes of operation” chapter of this manual.

NOTE: After changing the setting of this command to KISS, XKISS, LINESUB, MODEM, or GPS, a soft reset is required for the new mode to take effect (see RESET for details).

IO

immediate

When this command is entered, the digital inputs are sampled, and the result is displayed in an 8 bit binary number.

A 1 = a logic high, and a 0 = a logic low.

The first three bits (bbbxxxxx) equate to digital inputs 1, 2, and 3, and are located on the 10 pin Telemetry jack (J6), on pins 1, 3, and 5.

The forth and fifth bits (xxxbbxxx) equate to the current state of the control line outputs (CTRLA and CTRLB) on pins 8 and 4 on the radio port (J5). CTRL OFF = 1, CTRL ON = 0.

The sixth bit (xxxxxbxx) equates to the state of the ignition input on the Power jack (J7). 1 = ignition OFF, 0 = ignition ON.

The seventh bit (xxxxxxbx) equates to the state of the external carrier detect input.1 =XCD high, 0 = XCD low.

The eighth bit (xxxxxxxb) equates to the state of PTT-IN on the radio port (pin 7). 1 = inactive, 0 = active.

K

immediate

This single letter command is synonymous with CONVERS. It is included as a single-keystroke convenience for entering Convers Mode.

See also: CONVERS

LCOK {ON | OFF}

default ON

When ON, no character translation occurs in the TNC. If OFF, lower case characters will be translated to upper case before being output to the terminal from the TNC. This case translation is disabled in Packet Transparent Mode.

LEDS {ON | OFF}

default ON

To conserve power, disable the indicators (LEDS) on the front-panel of the MT1200 by setting LEDS to OFF.

LFADD {ON | OFF}

default OFF

When ON, a line-feed will be appended to every carriage return received from the keyboard before being transmitted. When OFF, no line feeds will be added to the transmitted signal.

LFSUP {ON | OFF}

default OFF

When ON, this command suppresses any line-feed characters received from the other station, relying on your terminal program to properly advance to the next line. When OFF, the line-feeds received from the other station are not suppressed but are sent to your terminal as received.

See also: AUTOLF, CRSUP

LGETCHAR $xx

default $05 (CTRL-E)

LGETCHAR specifies a hot key functional in command or converse mode. This key causes the current position data as specified by the GTEXT string to be output to the RS232 port. Set it to 0 to disable it.

LLIST [ON | OFF] [NONE | {+|-}callsign | callsign1,callsign2...]

default OFF

LLIST is used to determine which stations (callsigns) may NOT use your station for ANY purpose, including digipeating. When LLIST is ON, the TNC will NOT recognize those packets received with any callsign that appears in the LLIST's (lid) list of callsigns. In addition, when LLIST is ON, you will not be able to connect to any station that is on that list.

The maximum number of callsigns allowed in LLIST is 10. Up to 10 callsigns may be entered at once, using the format shown after the command name, and the new list of from 1 to 10 callsigns will replace whatever list was there before. The LLIST command can be used to add a single callsign (+callsign), so long as there is room for the new callsign on the list (if there is not, the TNC responds with "EH?" and returns you to the command prompt). Similarly, you can remove a single callsign (-callsign) from the list. And to remove all items from the current list, enter LLIST NONE.

A callsign entered without a SSID will match any SSID of that callsign. To match a specific SSID only, enter the callsign with that SSID: for example, callsign-n, where n = 0-15.

LOCATION

immediate

This command requests display of the current data in all of the GPS variables. If GPS position is not currently valid, no data will be displayed.

LOG [ALL | yyyy-mm-dd hh:mm:ss [TO yyyy-mm-dd hh:mm:ss]]

immediate

This command requests the display of stored GPS data.

When the LOG command is entered alone, the number of records stored in the GPS log will be displayed.

When entered with the ALL option, all stored GPS data records will be displayed.

When entered with the a specific date and time, all records stored since that time will be displayed.

When entered with a date range (from date and time, to date and time), all records stored within that range will be displayed.

Note: the LOG function is not available in some units.

MALL {ON | OFF}

default ON

When ON, monitored packets include connected and unconnected packets between other stations. If OFF, only other station's unconnected packets (UI frames) will not be displayed.

This is a useful arrangement when stations are talking as a group in an unconnected configuration.

See also: MONITOR

MAXFRAME n **(n = 1 - 7)**

default 4

MAXFRAME sets an upper limit on the number of unacknowledged information packets, which can be outstanding at any one time. The TNC will send MAXFRAME number of packets in a single transmission, if they are available.

See also: PACLEN

MBEACON {ON | OFF}

default ON

This command determines whether packets addressed to Beacon or ID will be displayed on the screen.

If you do not wish to display Beacon or ID packets, turn this command OFF.

See also: BEACON, ID, MONITOR

MCOM {ON | OFF}

default OFF

Supervisory (control) packets are not monitored unless MCOM is set ON and MON is ON. In addition if your station is connected, control packets are not monitored unless MCON is also ON. Control packets, when displayed, are distinguished from information packets by the “<>” and “<<>>” character sets appended to the packet header. With these characters, a letter is included to denote the type of control packet received, e.g. <<c>> - a connect request packet. The types of control packets are listed below.

<C>	Connect request
<D>	Disconnect request
<DM>	Disconnected Mode
<UA>	Unnumbered Acknowledge

In addition, the following bracketed information will be added to the Information packets as appropriate:

<UI>	Unconnected Information frame
<Is>	Information frame (connected);

s = send sequence number

See also: AX25L2V2, MONITOR, MRESP

For details on control packets, see the book *AX.25 Amateur Packet-Radio Link-Layer Protocol Version 2.0 October 1984*, available from the ARRL.

MCON {ON | OFF}

default OFF

When OFF, and connected, the TNC will display only those packets addressed to you.

When OFF, and not connected, all eligible packets (as determined by other monitor commands) will be displayed.

When ON, all eligible packets will be displayed, whether connected or unconnected.

See also: MONITOR

MHEADER {ON | OFF}

default ON

When ON, the headers are displayed for all monitored packets. When OFF, headers are not displayed and only data is output to the terminal. Since only I and UI frames have data, only these frames are displayed.

➔ To avoid confusion when MHEADER is OFF, use BUDLIST to restrict the monitored data.

See also: MONITOR, MCON, MBEACON, MALL, SUPLIST, BUDLIST

MONITOR {ON | OFF}

default ON

When ON, unconnected packets will be monitored unless prohibited by SUPLIST, BUDLIST, CONLIST, or LLIST. This will also allow monitoring of other packets if permitted by the other monitor commands. The MONITOR command acts as a master switch for the MALL, MCOM, MCON, MRESP, and MRPT commands. The addresses in the packet are displayed along with the data portion of the packet. Callsigns (to and from fields) are separated by a “>”; and the Secondary Station Identifier (SSID) is displayed if it is other than 0. If any data is contained in the monitored packet which does not follow the AX.25 protocol, it is displayed in curly braces on the header line. All monitor functions are disabled in the Transparent Mode.

When OFF, you will see just the data from those stations connected to you, no matter how other monitor commands are set.

See also: BUDLIST, CONLIST, HEADERLN, LLIST, MALL, MBEACON, MCOM, MCON, MRESP, MRPT, MSTAMP, PID, SUPLIST

MRESP {ON | OFF}

default OFF

When ON, monitored packets include the following AX.25 response packets, if MONITOR and MCOM are ON. If connected, MCON must also be on. The bracketed information will appear at the end of the header information. The “<” and “<<” characters are used to bracket and denote packets received as version 1 or version 2, respectively. For example, “<<RR1>>” denotes a version 2 packet. In addition upper case characters are used to designate commands (polls) and lower case characters are used to denote responses for RR, REJ, and RNR. For example, “<<rr1>>” is a response in version 2.

<FRMR>	Frame Reject
<REJr>	Reject, r = received sequence number
<RNRr>	Device busy, r = received sequence number
<RRr>	Receive Ready, r = received sequence number

In addition, the following bracketed information will be added to the Information packets as appropriate:

<Isr> Information frame (connected);

s = send sequence number,

r = received sequence number

See also: AX25L2V2, MCOM, MONITOR

For more information, see the book *AX.25 Amateur Packet-Radio Link-Layer Protocol Version 2.0 October 1984*, which may be obtained from the ARRL.

MRPT {ON | OFF}

default ON

This command affects the way monitored packets are displayed. If ON, the entire digipeat list is displayed for monitored packets, and the station that relayed the packet is indicated with an asterisk. The MONITOR command must be ON for this command to work, and if connected MCON must also be ON. If OFF, only the originating station and the destination station callsigns are displayed for monitored packets.

See also: MONITOR

MSTAMP {ON | OFF}

default OFF

This command enables time stamping of monitored packets. The date and time information is then available for use for automatic logging of packet activity or other computer applications. The date and time are set initially by the DAYTIME command, and the date format is determined by the DAYSTR command. The MONITOR command must be ON for this command to work, and if connected MCON must also be ON.

See also: CSTAMP, DAYTIME, MONITOR

MXMIT {ON | OFF}

default ON

When ON, the MT1200 will display transmitted packets as monitored data on your terminal. Repeated packets will be displayed as they are sent over the radio. The frames to be displayed will be controlled by the MONITOR, MCOM, MCON, and MRESP commands, and will obey the settings of TRACE, MSTAMP, HEADERLN, 8BITCONV and FILTER commands.

See also: MONITOR

MYALIAS xxxxxx-n **(n = 0-15)**

default (blank)

Setting this command to a callsign or character string enables digipeating by using the MYALIAS. Enter up to six characters (plus optional SSID) which is different than used for MYCALL, or MYREMOTE. For example: you may enter LAW-3 as the MYALIAS, which would be easier to remember for stations wishing to digipeat through a station in Lawrence, enroute to a station more distant. You may disable the alias digipeating with the command MYALIAS %.

See also: DIGIPEAT, HID

MYCALL xxxxxx-n **(n = 0-15)**

This command tells the TNC what its callsign is.

The extension n is called a Secondary Station Identifier (SSID) and is defaulted as 0, but may be any number from 0 to 15. All packets originated by the TNC will contain this callsign in the FROM address field. Any packets received by the TNC with this callsign in the TO address field or digipeat fields will be responded to appropriately (connect, disconnect, ack, digipeat, etc.).

➔ When the TNC is first turned on out of the box, or after a hard reset, it asks you for your callsign - there is no default. The callsign you enter then for MYCALL is automatically used to compute CWIDTEXT. Changing MYCALL at the “cmd:” prompt does not affect CWIDTEXT.

See also: CWIDTEXT, DIGIPEAT, ID, MYALIAS, MYREMOTE

MYDROP n **(n = 0-15)**

default 0

This command sets the KISS address of the radio port in the MT1200. A KISS frame with the upper nibble of the command byte set to this value will address this MT1200.

See also: INTFACE, KISS operation section

MYREMOTE xxxxxx-n **(n = 0-15)**

default (blank)

This command sets the callsign used for remote access of the TNC. Enter up to six characters (plus optional SSID) which is different than used for MYCALL, or MYALIAS. In addition, the RTEXT must be programmed with a text string. A station that connects will be sent a series of numbers that must be decoded according to RTEXT.

See also: RTEXT; Remote Access section

NEWMODE {ON | OFF}

default ON

When ON, the TNC will return to Command Mode if the a disconnect occurs.

When OFF, a disconnect will not cause the TNC to change modes.

See also: CONNECT, DISCONNECT, STATUS

NOMODE {ON | OFF}

default OFF

When OFF and a connection takes place, the TNC will change to whatever mode is specified in CONMODE. When ON, the TNC stays in Command Mode after connecting to another station; that is, it does not immediately change to Convers or Transparent Mode.

See also: CONMODE, CONNECT

PACLEN n **(n = 0 - 255)**

default 128

This command specifies the maximum length of the data portion of a packet. The TNC will automatically send a packet when the number of input bytes reaches n. This value is used in both Convers and Transparent Modes. A value of 0 means 256 bytes.

See also: MAXFRAME

PACTIME [EVERY | AFTER] n **(n = 0 - 255)**

default After 10

This command is used to pace the formation (and transmission) rate of packets in Transparent mode or in Convers mode if CPACTIME is ON. In addition, a PACTIME timer is necessary in transparent mode, since the SENDPAC character is ignored and treated as data. The timer is not started until at least one byte is entered for a packet; hence, a zero data length packet is never formed and sent.

When AFTER is specified, bytes are packaged (if any available) when input from the terminal stops for n*100 ms or when PACLEN is reached. When EVERY is specified, input bytes are packaged (if available) and queued for transmission every n*100 ms or when PACLEN is reached.

See also: CPACTIME, TRANS

PASS n **(n = $00 - $FF)**

default $16 <Ctrl+V>

This command selects the ASCII character used to allow the passage of any characters in Converse Mode.

For example, if you wish to send a COMMAND character (<Ctrl+C>) as part of the packet, you can do so by preceding it with the PASS character. The command character will be sent rather than returning the TNC to Command Mode. In Transparent Mode all characters are passed, there are no special functions except the one combination to get out of transparent mode. However, see TRFLOW.

PASSALL {ON | OFF}

default OFF

This command enables the attempt to display corrupted packets when PASSALL is ON. If a packet contains beginning and ending flags, the TNC will attempt to decode the address field as well as the data field and display the packet as specified by other commands such as MONITOR.

➔ When PASSALL is OFF, packets will be displayed only if the CRC (error checking) is correct and as specified by other commands such as MONITOR.

PERSIST n **(n = 0 - 255)**

default 63

This command, used with SLOTTIME, implements an algorithm for channel access to send packets. The algorithm used to determine whether or not to transmit using the PERSIST/SLOTTIME method has been shown to be considerably more efficient than the DWAIT method used by most standard AX.25 packet stations. The result of using the persistence algorithm is increased throughput under most channel conditions.

The value of “n” is used to determine if a packet will be sent after SLOTTIME expires. For example, let’s assume a PERSIST setting of 63 and a SLOTTIME setting of 10. This slottime setting corresponds to 100 milliseconds. When the TNC detects that the channel is clear and available (no carrier is detected), it starts a timer (SLOTTIME). When the timer expires, (100 ms in our case), the TNC generates a random number between 0 and 255. If the generated number is equal to or less than the PERSIST value, the TNC keys up the transmitter and sends the data packet. With our setting of 63 the odds of this occurring after the first slottime are 1 in 4. (Actually the probability is PERSIST plus 1 divided by 256.) If the TNC generated random number is greater than PERSIST, the TNC restarts the timer and waits for the timer to expire again before generating a new random number. This is repeated until the TNC gains channel access and sends its packet of information.

Making SLOTTIME smaller will cause the TNC to generate the random number more frequently, whereas raising the PERSIST value will give a better chance (improve the odds) of transmitting the data. Through careful choice of these values, it is possible to improve data throughput while at the same time permitting shared channel usage by

other packet stations. The persistence algorithm has been added on top of the DWAIT algorithm.

See also: SLOTTIME

PID {ON | OFF}

default OFF

When OFF, only those packets with a protocol ID of $F0 (pure AX.25) are displayed. When ON, all packets are displayed. Some of the information in non-AX.25 packets (for example: TCP/IP, NET/ROM or TheNet) can cause some computers to lock up. Net/Rom, TheNet and G8BPQ nodes have a PID of $CF, TCP/IP uses $CC and $CD, and standard AX.25 is $F0.

PING xxxxxx-n **(n = 0-15)**

Entering the PING command and a callsign, will send a special packet to that station requesting a PING response from that station with the data specified by its GTEXT setting.

PMODE {CMD | CONV | TRANS}

default CMD

The PMODE command controls the mode your MT1200 will be in when it is first powered up or reset. When set to CMD, the MT1200 will produce a sign-on message followed by the command prompt. When set to CONV, the unit will be in the Convers Mode. Setting PMODE TRANS sets the MT1200 in Transparent Mode. Exiting Transparent Mode with three <Ctrl+C>s will put the MT1200 in Command Mode.

RANGE a:b/c:d

default 0:255/0:255

The 2 A/D inputs are normally read by the microprocessor as a single byte value from 0 to 255, representing a voltage from 0 to +3.3 V on the analog input pin on the telemetry jack.

You can use the RANGE command to mathematically convert that single byte value to any offset and scale you want. If you would like the input to be expressed as a voltage with 2 decimal precision, for example, set the range for that analog pin as 0-3.30. If you connect a temperature sensor to an A/D pin, which outputs 0-3.3 V for temperatures of

–40 to 100, set the range for that input to –40 to 100.0. A pressure sensor that gives 0-3 V for 1 PSI would use a range of 0 to 1.25.

See also: ANALOG, TELEMETRY

REDISPLA n **(n = $00 - $FF)**

default $12 <Ctrl+R>

This command is used to change the REDISPLAY input editing character. The parameter n is the ASCII code for the character you want to type in order to REDISPLAY the packet or command currently being entered.

You can type this character to cause the TNC to redisplay the packet you have begun. When you type the REDISPLAY-packet character, the following things happen: First, type-in flow control is released (if FLOW was enabled). This displays any incoming packets that are pending. Then a \ (backslash) character is displayed, and the packet or command you have begun is redisplayed on the next line. If you have deleted and retyped any character, only the final form of the packet will be shown. You are now ready to continue typing. Incoming packets will continue to be displayed until you type the next character of your current message.

You can use the REDISPLAY-packet character to see a “clean” copy of your input if you are using a printing terminal (or have BKONDEL OFF) and you have deleted characters. The REDISPLAYed packet will show the corrected text.

You can also use this character if you are typing a message in Convers Mode and a packet comes in. You can see the incoming message before you send your packet, without canceling your input.

See also: BKONDEL, CANLINE, CANPAC, FLOW

RELINK {ON | OFF}

default OFF

When OFF, the TNC operating with AX25L2V2 ON does not attempt to automatically reconnect. When ON, the TNC operating with AX25L2V2 ON will attempt to automatically reconnect after RETRY is exceeded.

See also: ax25l2v2, retry, tries

RESET

immediate

This command is used to perform a soft reset. Any existing connections will be lost, even though the other station may still indicate a connection to your station. The initial sign-on message will be displayed.

See also: INTFACE, MYREMOTE, RESTORE

RESTORE D

immediate

When the command RESTORE D is given, the MT1200 will revert to its factory default settings, and will start to its AUTOBAUD routine.

See also: RESET

RETRY n **(n = 0 - 15)**

default 10

This command specifies the number of packet retries. Packets are re-transmitted n times before an operation is aborted. The time between retries (when no acknowledgment is received) is specified by the command FRACK.

See also: AX25L2V2, FRACK, RELINK, TRIES

RING {ON | OFF}

default ON

When ON, three bell characters ($07) are sent to the terminal with each "*** CONNECTED TO" message (when another station initiates the connect).

RNRTIME n **(n = 0 - 255)**

default 0

RNRTIME is set in 10-second increments. If a connection stays in a remote device busy state (continues to receive RNR frames) for RNRTIME, the TNC will disconnect. Setting RNRTIME to 0 disables this function.

See also: MRESP

RPRINT text **(text up to about 250 characters)**

immediate

This is an immediate command, which sends the “text” string to the device attached to the RS232 port. It is intended to allow a remote SYSOP (connected to the MT1200 through its MYREMOTE callsign) to send a string of data to output from the serial port of the MT1200, to a device attached to its serial port.

RTEXT text **(up to 128 characters)**

default (blank)

This command sets the password string for use when accessing the MYREMOTE remotely. When you connect to the MYREMOTE, the MT1200 will send three lines of numbers, one of which must be properly decoded (matching position number with string character) using this string.

For instance, if the RTEXT is set to “This is my RTEXT string” and you connect to the MYREMOTE, the TNC would send three sets of random numbers. The numbers would look like:

5 20 14 7 18 3

7 1 4 14 8 19

9 3 8 12 22 1

You must then pick ONE of these lines and decode the password string (i.e., assign letters to each letter position). Let’s say you choose to decode line 3 (9 3 8 12 22 1). Rewriting the RTEXT string to make this easier we have:

```
          11111111112222
123456789012345678901 23
This is my RTEXT string
```

Now, decoding the string, character 9 is “m” character 3 is “i”, character 8 is “ ” (i.e., blank), character 12 is “R”, character 22 is “n”, and character 1 is “T”. You must send the following in response to the string of numbers:

mi RnT

If correct, you’ll receive the MYREMOTE prompt (“prompt:”).

➔ Note that case is significant and spaces are considered valid characters.

If you fail to properly decode the password, the remote MT1200 will send three new lines of numbers. You will be given a maximum of three attempts to properly decode the

password string. If you fail in three attempts, the TNC will disconnect. After failing in three attempts, the MYREMOTE is disabled for 15 minutes.

SCREENL n **(n = 0 - 255)**

default 0

This value is used to format the data that is sent to your terminal. A “CR” character is inserted in the data sent to the terminal when n characters have been printed. A value of zero inhibits this action.

See also: AUTOLF

SENDPAC n **(n = $00 - $FF)**

default $0D <Ctrl+M> (CR or ENTER)

This command specifies a character that will force a packet to be sent in Convers Mode. In the Convers Mode, packets are sent when the SENDPAC character is entered or when PACLEN is achieved.

See also: CPACTIME, CR

SLOTTIME n **(n = 0 - 255)**

default 10

n specifies the amount of time, in 10 ms increments, between successive tries of the persistence algorithm.

See also: PERSIST

START n **(n = $00 - $FF)**

default $11 <Ctrl+Q>

This command specifies the character sent by the computer to the TNC to restart output from the TNC. If set to $00 only hardware flow control will be used. For software flow control, set this parameter to the character the computer will send to restart data flow.

See also: STOP, XFLOW, XOFF, XON

STATUS [LONG]

immediate

Entry of the STATUS command will display the number of bytes available (i.e., free bytes) in the RS232 input buffer, the current “connect” status of the radio port, and report of any outstanding (not yet acknowledged) characters or packets to a connected station.

Adding the option LONG will cause the TNC to display the current status, and MYREMOTE.

A pound sign ‘**#**’ (octothorpe) indicates that there is unacknowledged data in that buffer. The number immediately following the # is the number of bytes outstanding. The number in parentheses is the number of packets not yet acknowledged.

The following is an example of a display (using STATUS LONG).

```
cmd: status long
FREE BYTES 1661
#50(2) CONNECTED to KCØCON
REM DISCONNECTED
```

See also: MYREMOTE

STOP n **(n = $00 - $FF)**

default $13 <Ctrl+S>

This command specifies the character sent by the computer to the TNC to stop output from the TNC. If set to $00 only hardware flow control will be used. For software flow control set this parameter to the character the computer will send to stop data flow.

See also: START, XFLOW, XOFF, XON

SUPLIST [ON|OFF] [NONE | {+|-}call | call1,call2,..]

where call={callsign | {<|>}callsign |

callsign{>|<>}callsign}

default OFF NONE

SUPLIST is used to determine which received packets will not be displayed, i.e. suppressed. When OFF or NONE, SUPLIST will not prevent the display of packets, even if it has callsigns in its list.

The maximum number of callsigns allowed in SUPLIST is 10. Up to 10 callsigns may be entered at once, using the format shown after the command name, and the new list of from 1 to 10 callsigns will replace whatever list was there before. The SUPLIST command can be used to add a single callsign (+callsign), so long as there is room for the new callsign on the list (if there is not, the TNC responds with “EH?” and returns you to the command prompt). Similarly, you can remove a single callsign (-callsign) from the list. And to remove all items from the current list, enter SUPLIST NONE.

A callsign entered without a SSID will match any SSID of that callsign. To match a specific SSID only, enter the callsign with that SSID: for example, callsign-n, where n = 0-15.

Selective display is enabled when one or two callsigns are combined with a “>” and/or “<” character. For example, entering “>callsign” will disable display of packets TO that callsign (assuming SUPLIST is ON), entering “<callsign” will disable display of packets from the callsign, entering “callsign1>callsign2" will block display of packets from callsign1 to callsign2, and entering ”callsign1<>callsign2" will block display of packets from callsign1 to callsign2 and vice versa.

➔ Note that entering call>call or call<>call counts as two of the 10 maximum allowed callsigns.

See also: MONITOR

SWP u,d,t

default 17,17,108

This command sets the parameters used for software carrier detect. The first number (u) is used to increment a counter when a valid mark/space or space/mark transition occurs in the received signal (i.e. transition occurs at the beginning of a bit time). The second number (d) is a penalty subtracted from the counter when a transition occurs in the middle of a bit time. The (t) value is the threshold value—when the counter total reaches this value, the carrier detect will be set true.

The values need to be separated by commas as they are entered (as shown). Also as shown, spaces between values are not necessary—but entering spaces after the commas is OK.

Once carrier detect is active, the counter must drop to 0 before carrier detect is again made false.

See also: CD

TELEMETRY n **(n = 0 - 255)**

default 0

A telemetry beacon is sent every n*10 s. If n = 0, the beacon is disabled. The telemetry beacon is a UI frame.

The command called TELTEXT defines the content of the Telemetry beacon.

The command called TPATH defines the destination address and digipeat path for the telemetry beacon.

See also: ANALOG, RANGE, TELTEXT, TPATH

TELTEXT

Default: VOLT,TEMP,ANA1,ANA2,ANA3,IO

This command defines the format of the data in the telemetry beacon. The default format is compatible with APRS telemetry data format.

When transmited, the data in telemetry beacons will begin with a sequence number “T#nnn” .“nnn” is a decimal count for the telemetry beacon and is incremented by 1 each time the beacon is sent. In an initial Telemetry beacon, or after the unit is reset, the beacon counter begins at 001 (T#001). After reaching 999 (T#999), the counter cycles around to 001 (T#001).

The data contained in the Telemetry beacon can consist of any one or all of several parameters, in any order. Those parameters are; VOLT, TEMP, ANA1, ANA2, ANA3, ANA4, ANA5, IO.

VOLT is the measured voltage input to the power supply jack of the MT1200. It will be displayed as a three digit number (where-as VOLT is normally displayed as two digits, as decimal point, and a third digit).

TEMP is the measured temperature inside the MT1200 case.

“ANA1", ”ANA2", “ANA3”, ”ANA4”, and “ANA5”, are the decimal readings on the corresponding analog inputs. The value displayed will be in the range as specified in the RANGE command. ANA1 and ANA2 are the two analog inputs to the Telemetry jack (J6). ANA3-4-5 are valid inputs to the MT1200 microprocessor, but have no circuitry attached (but do have solder pads).

+ Note: APRS expects leading zeroes for the analog readings; you must set RANGE to 0-255 to use the APRS format.

IO is in the format “bbbbbbbb”, and is an 8 bit binary display, where “b” = “1" means a Logic High on the pin and ”b" = “0" means a Logic Low on the pin. The first three bits ”bbbxxxxx" in the string are the logic levels of the three digital inputs on the temetry jack “J6”. The forth and fifth bits “xxxbbxxx”, reflect the current settings of the control line outputs (CTRLA and CTRLB) on the radio port J5. CTRL ON displays as “0”, and CTRL OFF displays as “1”.

See the documentation on APRS for more information on the use of telemetry along with GPS.

See also: ANALOG, IO, RANGE, TELEMETRY, TPATH

TEMPERAT

immediate

This command displays the current temperature from the on-board sensor inside the MT1200. The command GUNITS determines whether the displayed termperature will be in English unit (Farenheight), or in Metric unit (Centigrade).

TPATH {DEST [VIA call1],call2],call3],call4]}

default APEK12

This command establishes the destination address of TELEMETRY beacon packets, and specifies any digipeaters to use (up to a total of 4 digipeaters).

DEST = destination address. The default “APEK12” is the standard destination address for APRS telemetry beacon packets. Any name or callsign can be entered for the destination (up to 6 alpha or numeric,with 1 – 15 SSID).

VIA call1 - call4 = optional stations to be digipeated through. A maximum of 4 digipeat addresses (callsigns or aliases) can be specified. This is referred to as a path.

Each callsign may also have an optional Secondary Station Identifier (SSID) specified as -n, where n = 1 - 15. The digipeat callsigns are specified in the order in which they are to relay transmitted packets.

See also: TELEMETRY

TRACE {ON | OFF}

default OFF

When ON, all received frames are displayed in their entirety, in hexadecimal, including all header information. All packets, which are eligible for monitoring also, will be displayed in normal text.

TRANS

immediate

This command causes immediate exit from Command Mode into Transparent Mode. The current link state is not affected. There are no special editing characters, all characters are sent out as received. To get out of Transparent, send the TNC a modem break if BREAK is ON, or see CMDTIME for a special keyboard sequence.

See also: BREAK, CMDTIME, COMMAND

TRFLOW {ON | OFF}

default OFF

This command allows the TNC to respond to software flow control from the computer while in the Transparent Mode. When TRFLOW is OFF, software flow control is not used in the Transparent Mode. Hardware flow control will be expected from the computer by the TNC. The computer program needs to use hardware flow control, and the RS232 cable needs to be wired with CTS and RTS connected. When ON, software flow control is enabled, and the START and STOP characters are sent by the computer to the TNC to control the flow of data. When START and STOP are set to $00, hardware flow control must be used. If not zero, the TNC will respond to the computer's START and STOP characters, and remain transparent to other characters from the terminal or computer for flow control.

When START and STOP are set for software flow control (normally <Ctrl+Q> and <Ctrl+S>), all characters can be received in Transparent Mode (including the START and STOP characters) by setting TRFLOW ON and TXFLOW OFF. You will not, however, be able to send the START and STOP characters, since the TNC will interpret them as flow control.

See also: TRANS, TXFLOW, XFLOW

TRIES [n] **(n = 0 - 15)**

The TRIES command will display and optionally set the number of attempts, which have been made to re-send a packet which failed to reach its destination. For instance, if

RETRY is set to 10, TRIES will show how many attempts have already been made to pass the data. For example, if TRIES were to show 8, “TRIES 3” would reset the counter to make the TNC believe that it had only tried 3 times so far, thus allowing 7 more attempts before the RETRY limit is exceeded.

See also: RETRY

TXDELAY n **(n = 0 - 255)**

default 30

This command sets the transmitter key-up delay as 10*n ms. This setting establishes the time delay between the application of push-to-talk and the start of packet data to the transmitter. Flags (characters to begin packet) are sent during the delay. This command needs to be set long enough to give your transmitter time to come to full power before data is sent. If set too short the beginning of the packet will be chopped off and another station will never be able to decode you. If set too long, additional flags at the beginning (heard as a repetitive sound) waste airtime. It may be necessary to increase your TXDELAY to allow the receiving station sufficient time to switch from transmit back to receive to detect your signal.

TXFLOW {ON | OFF}

default OFF

This command allows the TNC to send software flow control (XON and XOFF) to stop and restart the flow of data from the computer while in the Transparent Mode. When TXFLOW is OFF, hardware flow control must be used between the computer and TNC. RTS and CTS must be connected between the TNC and computer for hardware flow control. When TXFLOW is ON, software flow control between the TNC and computer in Transparent Mode will depend on the setting of XFLOW. XFLOW ON enables software flow control, XFLOW OFF disables it. When software flow control is enabled, the TNC will send the XON and XOFF characters to the computer to control data flow.

When set for software flow control, all characters can be sent in Transparent Mode (including the XON and XOFF characters) by setting TXFLOW ON, XFLOW ON and TRFLOW OFF. You will not, however, be able to receive the START and STOP characters, since your terminal program should interpret them as flow control.

See also: TRANS, TRFLOW, XFLOW

UIDIGI ON [+|-] call1[,call2[,call3[,call4]]]

default OFF NONE

Up to 4 call signs can be specified for special digipeater duty. If any of the UIDIGI calls appears in the to-be-digipeated field of a UI packet, and if MYCALL does not appear in the source field or any of the has-been-digipeated fields, the UIDIGI call in the to-be-digipeated field will be replaced by MYCALL with the H bit set and the packet will be digipeated.

See also: dwait, persist, uidwait, unproto

UIDUPE n **(n = 0–255)**

default 0 (disabled)

Timer for UI duplicate checking. Use of this “do not duplicate within n seconds” feature helps control the number of UI frames digipeated.

See also: uiflood and uitrace.

UIDWAIT [ON|OFF]

default OFF

When UIDWAIT is OFF, “special” digipeat packets (those formed by UIDIGI, UIFLOOD, or UITRACE only) have their usual channel access; there is no wait DWAIT or slottime added before transmission once the channel is clear. However, if UIDWAIT is set ON, the packets waiting to be digipeated will be subject to the same wait times as not-to-be-digipeated packets awaiting transmission.

\+ By subjecting “special” to-be-digipeated packets to a delay determined by slottime and persist, it is more likely that to-be-digipeated packets of two or more stations in the same vicinity would not collide. This may be good if one wants to guarantee that a digipeated packet will “make it out” of its neighborhood but bad if one wishes to limit the number of times a packet is redigipeated, such as in APRS applications.

See also: dwait, persist, uidwait

UIFLOOD name[,time[,{FIRST | ID | NOID}]] **(name = 5 char max)(time = 0-255)**

default disabled,30,NOID

When a UI frame is received with a call in the to-be-digipeated field of the form ‘name’ x-y where x is a number (1-7) appended to ‘name’ and y is an ssid (1-7), the ssid is

decremented and the UI frame is digipeated without setting the H bit. When the packet is digipeated, a checksum is formed over the source, destination, and data fields of the packet. This checksum is kept for time seconds (0-255). If an incoming UI packet is eligible for digipeating as above, but its checksum matches one of those being saved, the packet is discarded (not digipeated). The buffer holds a maximum of 64 checksums. If the optional parameter ID is selected, the MYCALL call sign is inserted in an additional digipeater address field with its H bit set.

See also: uidwait

UITRACE name, n (name = 5 char max)(n = 0-255)

default disabled, 30

When a UI frame is received with a call in the to-be-digipeated field of the form ‘name’ x-y where x is a number (1-7) appended to ‘name’ and y is an ssid (1-7), and MYCALL does not appear in the source field or any of the has-been-digipeated fields, MYCALL with the H bit set is inserted before the to-be-digipeated field, the ssid of the to-be-digipeated field is decremented, and the UI frame is digipeated without setting the H bit of the to-be-digipeated field. The value of n sets a delay time between duplicate digipeats. Use of this “do not duplicate within n seconds” feature helps control the number of UI frames digipeated.

If the packet should already have 8 digipeater fields, MYCALL is not inserted.

See also: dwait, persist, uidwait

UNPROTO {DEST [VIA call1],call2],call3], call4] | NONE}

default CQ

Sets the path for transmitted UNPROTO and ID packets.

DEST = destination address (this is really just a “dummy” address, as no connection takes place, people often put their name or CQ here)

VIA call1 - call4 = optional stations to be digipeated through. A maximum of 4 digipeat addresses (callsigns or aliases) can be specified. This is referred to as a path.

Each callsign may also have an optional Secondary Station Identifier (SSID) specified as -n, where n = 1 - 15. The digipeat callsigns are specified in the order in which they are to relay transmitted packets.

This command is used to set the digipeat and destination address fields for packets sent in the unconnected (unproto) mode, and ID beacons. Unproto packets do not receive an acknowledgment and are not retried. They are sent as Unnumbered I-frames

<UI>. If UNPROTO is “NONE”, no unconnected packets will be sent except for BEACON and ID.

Unconnected packets sent from other stations can be monitored by setting MONITOR ON. If you are in a connection with a station, and you wish to see monitored packets (from stations to which you are not connected), you must set MCON ON.

See also: ID, HID, MCON, MONITOR, MRPT, XMITOK

VERSION

immediate

This command causes the MT1200 to display its current version number along with the name of the unit.

VOLTAGE

immediate

This command causes the display of the current power supply voltage input to the MT1200.

XCDENA {ON | OFF}

default OFF

When set to ON, causes external carrier detect (XCD, pin2 on the radio port) to be recognized at all times. Transmission will be inhibited when XCD is active.

When set to OFF, XCD will only be recognized when the CD command is set to EXTERNAL.

See also: CD, CDINVERT.

XFLOW {ON | OFF}

default ON

When ON software flow control will be implemented according to the settings of START, STOP, XON, XOFF. For normal software flow control set XFLOW ON, START $11, STOP $13, XON $11, XOFF $13. The TNC expects the computer or terminal to respond to the flow control characters XON and XOFF, and the TNC responds to the START and STOP characters from the computer. When XFLOW OFF, the TNC will only use and recognize hardware flow control lines (CTS and RTS) to start or stop data. The

RS232 cable must be wired appropriately. If the software flow control characters are set to $00, software flow control is not possible.

In the Transparent Mode flow control is also determined by the settings of TRFLOW and TXFLOW.

See also: START, STOP, TRFLOW, TXFLOW, XOFF, XON

XKCHKSUM {ON | OFF}

default OFF

This command only applies when INTFACE is set to XKISS. The value of XKCHKSUM controls whether or not the XKISS CHECKSUM mode is active.

See also: XKPOLLED

XKPOLLED {ON | OFF}

default OFF

This command only applies when INTFACE is set to XKISS. XKPOLLED controls whether or not the XKISS POLLED mode is active.

See also: XKCHKSUM

XMITLVL n **(n = 0-502)**

default 100

This command may be used to set the modem drive level. You may find it more convenient to use the CAL command in that it allows you to continuously adjust drive level by holding down the + or – key while in calibrate mode.

The voltage range set by the XMITLVL command is from 1 mV to 4 V p-p. From a count of 0 to 255, the voltage is increased from 1 mV to (approximately) 130 mV, or 0.50 mV per step. From a count of 256 and above, the voltage is increased linearly but in larger steps (approximately 15 mV per step) until 4 V (max) is reached at a count of 502.

XMITOK {ON | OFF}

default ON

When ON, transmitting functions are enabled. If turned OFF, transmitting is inhibited while all other functions of the TNC are unchanged.

XOFF n **(n = $00 - $FF)**

default $13 <Ctrl+S>

This command selects the character sent by the TNC to the computer to stop input from the computer. If set to $00, hardware flow control must be used. For software flow control set this parameter to the character the computer expects to see to stop sending data to the TNC.

See also: XFLOW, XON

XON n **(n = $00 - $FF)**

default $11 <Ctrl+Q>

This command selects the character sent by the TNC to the computer to restart input from that device. If set to $00, hardware flow control must be used. For software flow control set this parameter to the character the computer expects to see to restart sending data to the TNC.

See also: XFLOW, XOFF

Appendix A: Advanced Installation

This appendix gives you additional information on installation and configuration beyond that given in the chapter on **"Installing your MT1200".** We assume you have already read that chapter.

Precautions

The MT1200 is grounded through its connections to your transceiver, computer, and power supply. Make sure your transceiver is properly grounded and your computer has equal ground potential. Follow the grounding instructions in your transceiver manual.

The multi-conductor cable provided with your MT1200 is shielded. If you use other cabling, be certain it is shielded. We do not recommend the use of unshielded RS232 ribbon cable in an amateur radio environment.

Caution: Make sure the power to the transceiver, computer, and MT1200 is OFF before connecting any cables.

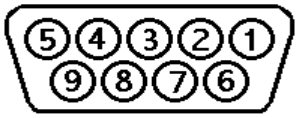
The MT1200 uses a standard RS232 serial port with a DSUB-9 connector configured as DCE equipment.

Connecting the MT1200 (Front panel DSUB-9) to the Computer

The MT1200 communicates with the computer using RS232 signaling. This is compatible with PC compatible computers, Macintosh, dumb terminal, and most other terminal devices. If your computer or terminal uses TTL levels (such as the Commodore 64), you will need an after-market converter to supply the RS232 signals required by the MT1200.

Diagram of Pin Numbers on DSUB-9 Connector

The following diagram shows the pin numbering on the DSUB-9 connector looking at the front of the MT1200:



Cable Wiring

All Kantronics software requires five wires between the computer and the MT1200. The pins that must be connected from your MT1200 to the computer for these programs are TXD, RXD, SG, RTS, and CTS. If you are using other software, you should refer to that documentation to determine the cable requirements for proper operation. Some software does not support hardware flow control and may fail to operate if the RTS and CTS lines are connected.

The MT1200 serial port connector on its front panel has 9 pins, which are configured as:

Pin Name	MT1200 Pin Number	Computer Pin Number (DSUB-9)	Computer Pin Number (DSUB-25)
RXD	2	2	3
TXD	3	3	2
RTS	7	7	4
CTS	8	8	5
DSR	6	6	6
SG	5	5	7
DCD	1	1	8
DTR	4	4	20

The purpose of the pins (by name) is:

SG – SIGNAL GROUND: Common line for signals.

TXD - TRANSMIT DATA: This line carries the data from your computer to the MT1200.

RXD - RECEIVE DATA: This line carries the data from the MT1200 to your computer.

RTS - REQUEST TO SEND: The MT1200 checks this line to see if it is permitted to send data to your computer. This line is controlled by your computer software program, and is used for hardware flow control.

CTS - CLEAR TO SEND: The MT1200 uses this line to signal your computer when it can no longer accept data from the computer, or to signal that it is again ready to accept data. This pin is used for hardware flow control.

DSR - DATA SET READY: This line is set high to indicate that the modem is ON.

DCD - DATA CARRIER DETECT: The MT1200 uses this pin to signal the packet "connect" status through the radio port of the MT1200. If you are connected to another packet station, this output line to the terminal will be in active state. Some terminal programs will indicate "ON-LINE" when DCD is active. If you are disconnected, this line will be in inactive state.

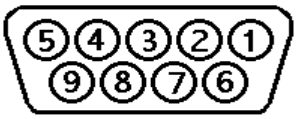
DTR - DATA TERMINAL READY: Although interconnected via a buffer IC to the processor, this line is currently ignored.

Terminal program settings

When using a standard terminal program to communicate with the MT1200, you must set the serial port configuration in your program for 8 data bits, no parity, and one stop bit. The baud supported by the MT1200 are 1200, 2400, 4800, 9600, and 19200. In general you should use the fastest baud your terminal program and hardware supports. The MT1200 defaults with ECHO ON, so you should set your terminal program for "full-duplex" operation.

Connecting to your Radio

The 1200-baud radio connector on the MT1200 rear panel is a 9-pin DB style connector, with pin layout as shown below:



Radio port pin numbers and functions

The purposes of each pin are as follows:

1 TXA	Transmit audio (AFSK out)
2 XCD	External carrier detect
3 PTT	Push-to-Talk
4 CTLB	Control line B
5 RXA	Receive audio (AFSK in)
6 GND	Ground
7 EXT-IN	External input for microphone PTT

8 CTLA Control line A

9 GND Ground (same as pin 6)

Pin 1: Connects to the microphone input of your radio, providing the audio signal to be transmitted.

Pin 2: When a ground is applied to this pin, the MT1200 will not transmit packets. This pin is normally used as an external means of supplying carrier detect, but can also be used as a “hardware” transmit inhibit.

Pin 3: When the MT1200 needs to key your transmitter, it will apply a ground to this pin. This is an open-drain circuit and requires a positive voltage from your radio (not to exceed 60 V dc or 115 mA).

Pin 4: This pin is the CONTROL B output from the MT1200 which may be used as a control line to your radio or other devices. It is an open-drain circuit, and will apply a ground on this pin when controlled by the CTRL command in your MT1200 (not to exceed 60 V dc or 115 mA).

Pin 5: Receive audio from your radio connects to this pin. This normally will connect to the external speaker jack on your radio, but may be connected to the receive audio output pin on your microphone connector (if available).

Pin 6: This pin connects to the ground of your radio mic connector.

Pin 7: This pin is an input, that is used for sensing the PTT from your microphone to the radio.

Pin 8: This pin is the CONTROL A output from the MT1200 which may be used as a control line to your radio or other devices. It is an open-drain circuit, and will apply a ground on this pin when controlled by the CTRL command in your MT1200 (not to exceed 60 V dc or 115 mA).

Pin 9: This pin connects to ground, same as pin 6.

Connecting to Hand-Held Radios

This section is for those who need more information than that given in the “Installation” chapter.

Many transceivers, especially most hand-held models, obtain Push-To-Talk keying by completing a circuit between the mic input and PTT ground. A direct PTT input to the mic input line of units with this type electret condenser microphone is not usable without some type of isolation.

If you plan to operate with a hand-held transceiver, the MT1200 has incorporated an isolation circuit which is available by positioning jumper J4 on the center post and the

left post (labeled HT) as you face the front of the MT1200. Should you later use a different type radio, this change may need to be reconfigured by placing the J4 jumper on the center post and the right post. Most other radios of current manufacture will not require any modification of the MT1200.

You may also interface to a hand-held without performing this modification by incorporating the same type of circuitry in the external cable between the MT1200 and your hand-held. Ground return and speaker audio, are both supplied through the external speaker jack of your hand-held. While you will need to check the exact requirements of your hand-held radio, the following guidelines may be useful:

- A 0.1 μF capacitor (non-polarized) usually is required in series in the transmit audio line from the TNC to any handheld transceiver (HT) radio. Even if a capacitor is not required for connection to a particular radio, it can still be installed, and transmit audio (packets) will pass through to the radio.

- ICOM HT radios key the PTT by providing a low impedance path from the mic input to ground. To accomplish this, simply install a resistor (approximately 3.9 kΩ seems to be a good value) in series with the PTT wire from the MT1200, and connect this to the mic input along with the AFSK line.

➔ The ICOM 2A style wiring is most common, and can be used with some Alinco, Azden, and standard HTs.

- YAESU and Radio Shack HTs are similar but use a mono plug and a 2.2 kΩ resistor.

- Most KENWOOD HT radios key the PTT line by connecting the sleeve of the mic connector to the sleeve of the external speaker connector. This means that you will not need a resistor in the PTT wire from the MT1200, simply connect the PTT wire to the sleeve of the mic connector. Another point to watch: most of the KENWOOD HTs (2600 and later) use a three pin mic connector. The AFSK from the MT1200 should therefore connect to the RING and not the TIP of the mic connector.

- Leave J4 in normal position (not HT) when using Kenwood HTs, or when using the isolation circuit (cap and resistor) in the external cable between the MT1200 and the radio.

Optional Connections to the Radio Port

Pin 7 of the DSUB-9 connector may be used as a “trigger”, to cause the MT1200 to transmit a GPS packet upon release of the microphone PTT.

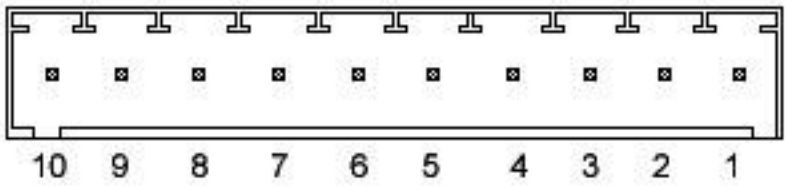
When this pin is connected to a pin on the radio that is active low, such as when the radio is transmitting by the microphone ptt button, upon release of the ptt a gps packet will be transmitted by the MT 1200.

Telemetry jack

The Telemety jack on the MT1200 is a 10-pin terminal block type socket. Six of the pins, 1 and 2, 3 and 4, 5 and 6, are three pairs of optically isolated digital inputs. Two pins, pins 7 and 9, are analog inputs. Two pins, 8 and 10, are grounds. The analog inputs are capable of sensing voltages in the range of 0 to +3.3 V.

> **NOTE:** the mating plug for the Telemetry jack is not included in the package with the MT1200. It can be ordered separately as an accessory from Kantronics, or can be ordered from a suitable supplier. The jack and mating plug are made by RIA-Connect. The manufacturers part number for the plug, is ASP0511006.

This rear view diagram showing the pin numbers in the I/O jack:



Appendix B: Advanced Information

Assembly and Disassembly

Should you require access to the MT1200 to reposition jumpers or for other purposes, disassemble as follows:

1. Turn off power to your MT1200 and remove all cables from the unit.
2. Using a small Phillips screwdriver, remove the two (2) case screws (located on each side of the case) completely.
3. Remove the top cover from the unit. NOTE: In most cases, no further disassembly of the unit is necessary. Only if you need to change a wire jumper or solder connections to the PC board should you continue with disassembly of your MT1200.
4. Remove the four (4) hex nuts on the rear and front panels that secure the DSUB-9 connectors to the case.
5. Remove the two (2) screws securing the front panel to the case.
6. Remove the front panel.
7. Observe proper static protection precautions and gently lift the front edge of the PC board to clear the front of the case.
8. Pull the PC board forward to remove the PC board from the case.

To reassemble, reverse the procedure above.

Hard Reset/Self-Test

The hard reset process is provided to re-initialize the MT1200 to its default values. This process may become necessary should operational problems be encountered or when upgrading your firmware to a new version. The readout specified in step 5 below will be legible only if your terminal baud is 19200. At other terminal bauds, the displayed messages will be garbled, or no display readout will be observed. This procedure is performed as follows:

1. Open the MT1200 by removing the two (2) case screws on the sides of the unit and lifting the cover.
2. Locate the Hard Reset jumper (J1). Jumpers are appropriately labeled on the PC board. Refer to the parts location diagram for help in locating them.
3. Place the jumper plug on both pins.

4. Apply power to the MT1200.

5. Observe the LEDs on the front of the MT1200. Each LED will light in turn, starting with Power, and ending with GPS status.

6. After the LED test, observe on the computer display (your terminal program must be set at 19200 baud):

   Erase user parameters? (Y/N)
   Enter Y or N

   Erase GPS log? (Y/N)
   Enter Y or N

   Verify GPS log? (Y/N)
   Enter Y or N

   Do IO test? (Y/N)
   Enter Y or N

   Turn unit off and remove jumper plug

   Note: the erase and verify GPS log messages will not be displayed in those units that do not have the flash chip inside where that data would be stored.

7. Turn power off.

8. Return jumper J1 to the normal position (plug on one pin only).

9. Reassemble the MT1200 and return to operation.

If you choose Y at the “Erase user parameters?” prompt, all changes to parameters will be cleared. The next power on of the MT1200 will be as starting a new unit, from autobaud. If you choose N, parameter changes will be retained, and those parameters will be in effect at the next power on.

If you choose Y at the “Erase GPS log?” prompt, all stored GPS data will be erased. If you choose N, any data in the GPS log will remain.

If you choose Y at the “Verify GPS log?” prompt, the GPS log will be checked for garbled or errant data. If you choose N, no check will be made.

If you choose Y at the “Do IO test?” prompt, the next screen will show all input line status, GPS status, temperature, and will allow toggling of all output lines and LEDs. Note, that toggling status of RS232 output lines may affect communication from the MT1200 to the computer. If you choose N, the self-test routine will end, and the prompt “Turn unit off and replace jumper” will be displayed.

Bios Load

The BIOS is the internal program that operates the MT1200. When a new version of programming is available, you may want to replace the currently installed version with that new version.

There have been several configurations of the MT1200(G). Some early units did not have the extra flash chip, which is used for storing GPS log information. BIOS files for these units must have “nolog” in their name, otherwise the bios load will fail. The “nolog” units will not have and empty space on the board at position U4 (located near the front center area of the MT circuit board.

The BIOS versions for the MT1200 (without internal GPS) and the MT1200G (with internal GPS), are different, and the correct bios file must be used.

The bios files for all the MT versions end in .HEX.

If you are unsure about which MT model and version you have, contact Kantronics Technical Service to verify. Have your unit open (top cover removed) when calling.

Start the BIOS load process by removing the top cover from the MT1200.

Locate the jumper, J9, next to the TEST jumper. With Power off, place the jumper on BOTH pins.

Switch power on, and observe the message “Do a test load first? (Y/N)”. If you choose Y, you will be able to send the BIOS file from your terminal program, to see if the MT1200 can receive that file properly from your terminal program. This will not actually change or affect the currently installed BIOS in your MT1200. If you choose N, the next step is to actually remove the currently installed BIOS, and load a new BIOS in its place.

Observe the message “”Sure you want to erase flash? (Y/N)”. If you choose Y, and send the BIOS file from your terminal program, the MT1200 will (providing that the file is received correctly) install that new BIOS version.

Warning!: If you choose Y to erase the current BIOS but do not then send the BIOS file or if it is not received correctly, the MT1200 will not have a valid BIOS from which to operate, and its only function will be in the loading of a new BIOS. Make sure that you have a valid replacement bios file available for your unit before starting. Bios files are available for download from the Kantronics web site, or can be emailed to you on request.

Calibration/Equalization

The CALIBRAT command is used to assist in adjusting the data transmitter drive level and also in adjusting the receive equalization of your MT1200. The procedures listed

below are a guideline for using the calibration command to adjust for optimum performance.

When you issue the CALibrate command, the following options will appear on your screen:

CALIBRATE MODE:
M send mark
R receive
S send space
T send square wave
– or + adjust XMITLVL while transmitting
X exit

Pressing M will transmit a constant MARK (signal) until another key is pressed.

Pressing R will measure a received square wave.

Pressing S will transmit a constant SPACE until another key is pressed.

Pressing T will transmit a square wave (space/mark) until another key is pressed.

Pressing X will exit the calibrate mode and reset the MT1200.

Drive level.

The drive level is set by a digital controlled pot, which provides an output range of 1 mV to about 2.0 V p-p, into a 10K load. The default setting of the XMITLVL command is 100, which corresponds to an actual output audio voltage of about 25 mV (into a 600 ohm load). After entering the calibrate mode (CAL), you should use the T option to initiate the transmission of mark and space tones together. Then, adjust the AFSK drive level by pressing the '–' or '+' key (and holding it down) until you achieve the drive level you need. Adjust the level to achieve about 3 kHz deviation from your transmitter.

Alternately, you can send a Mark tone only or a Space tone only, by pressing the M or S keys. This can be helpful to check the transmitter deviation with each tone.

Equalization.

If there is another Kantronics user nearby, you can have that station transmit a calibrate signal from their TNC, and choose the R option in your calibrate mode to measure the status of receive equalization. You will see two numbers displayed each time you press R. The MT1200 is measuring the mark-space tone levels as received from the other station. For best performance, the tone levels should be about equal. A ratio of up to 40/60 to 60/40 is acceptable, but a larger difference between the tone levels will cause problems in decoding the packet signals. Change jumper J2 if need be. Default is no equalization, since it's normally not needed.

Note: If you are using a High Impedance Data output from the radio, set J3 plug on one pin only (OFF = 10 kΩ, ON = 620 Ω).

Microprocessor Watchdog Timer

The MT1200 includes a microprocessor watchdog timer. In the unlikely event that its internal programming gets into an infinite loop, the watchdog timer will detect the failure and force a reset.

A/D Sensor Inputs

Two A/D inputs are available to the MT1200 and are used with the Analog command. These inputs can be used to measure dc external voltages from 0 V to 3.3 V dc with up to 8-bit accuracy.

The Analog input lines are located on pin 7 and pin 9 of the telemetry jack.

Note: If your connection to be measured has voltages greater than +3.3 V dc, a pair of resistors may be used as a voltage divider to be within the 0 to 3.3V range of the sensor input.

➔ **Note:** Maximum input measurement can be made. Maximum input voltages to the A/D inputs should not exceed 50 V or damage may occur

MT1200 Jumpers

Jumper Locations

➔ To locate jumpers listed below, use the schematic (pdf schematic file located on the cd shipped with the unit and the parts layout in Appendix D.

Jumper #	Printed Schematic Location	Name
J1	A-4	LED test, Hard Reset
J2	D-2	receive audio equalization
J3	D-2	receive audio input impedance
J4	C-1	normal/HT
J9	A-4	Flash test/Load

Note: If your MT1200 was purchased without the internal GPS, and you wish to use data from an external GPS (or other) device to the auxilary GPS input, you will need to solder in a jumper connecting the pads at position R27. This is usually already done by the factory.Then, your GPS device output should be connected to the XCD input (pin 2 on the radio port) of the MT1200.The input is enabled with the command GPSPORT.

Jumper Descriptions

J1: (Test/Hard Reset) When connected, then unit powered on, an LED test will commence. Next, an option of clearing user-changed parameters will be presented. If Y is chosen, all changed parameters will be cleared, and the unit will next power in Autobaud (like a new unit). If N is chosen, user parameters will remain.

Default is OPEN.

J2: (equalization) This two-pin jumper is used to set equalization for receive audio from the receiver. When placed on both pins, no equalization is selected, and when placed on one pin, partial equalization is used. See the calibration/equalization section for details.

Default is OPEN (no equalization).

J3: (receive audio equalization) this 2-pin jumper, when installed, sets input impedance of the modem to 600 Ω. When placed on one pin only, input impedance is set to 10 kΩ.

Default is OPEN.

J4: (NOR/HT) When placed on the center pin and the pin marked NOR, this configures the AFSK output line for use with base station radios. When placed on the center pin and the pin marked HT, this configures the AFSK output line to also serve as the PTT

line for HT radios. It should be left in NOR position when placing the HT isolation circuit (cap and resistor) in the external cable.

Default: NOR.

J9: (Flash Test/Load) This two pin jumper is used to test a flash load of the BIOS, or to load a BIOS into the MT1200. When connected and the unit powered on, The option of test loading a BIOS is presented. If Y is chosen, a BIOS file can sent to unit, and a report will be displayed. No changes will be made to the current BIOS in the unit. If N is chosen, the option of loading a new BIOS will be presented. If Y is chosen, a replacement BIOS can be sent. If successful, the new BIOS will replace the old one. Return the jumper to its normal (OPEN) setting, then power off/on the unit.

Defaut: OPEN

NOTE: All jumpers are located on the top side of the MT1200 circuit board.

Appendix C: In Case of Difficulty

Your Kantronics MT1200 is manufactured to very stringent quality standards. If you have followed the installation procedures outlined in this manual, it is highly unlikely that you will encounter a failure. If you do have difficulty, use the procedures described in this section to assist in isolating and correcting the problem.

MT1200 Does Not "Sign-On" to Computer

1. Carefully recheck cabling between your computer serial port and the MT1200.

2. Check carefully to insure that the Transmit Data, Receive Data, and Ground leads are connected to the proper pins.

3. If you have made a 5-wire connection to the computer serial port, change to a 3-wire connection. To use HyperTerminal, you need a 5 wire connection, so if you change to a 3 wire connection, you will need to use another terminal communication program.

4. Check your terminal program to be certain it is configured with the correct communications parameters (serial port, baud, parity).

5. Try a "Hard Reset" using the Hard Reset jumper. (Operate your terminal program at 1200 baud when performing a hard reset.)

You Are Unable to Make a "Connect"

1. Issue a connect request and observe the TNC's XMIT LED. If the XMIT LED illuminates, check to insure that the radio is connected to the radio port. If the XMIT LED does not illuminate, check to be sure the XMITOK command is turned ON.

2. Observe the radio to determine if it is being switched to the "Transmit" condition. If not, recheck wiring between the MT1200 radio port, PTT pin, and ground on the microphone jack.

3. Set the CD command to INTERNAL and turn the radio squelch control to "OFF" and see if the RCV LED illuminates on the packet controller. If it does not light, recheck the audio connection between your transceiver and the MT1200.

4. If possible, monitor your transmitted signal with another radio. If the transmitter is keying to "Transmit" but weak or no audio is monitored, increase AFSK output as necessary using XMITLVL command. (See the AFSK Output Level section.)

Cannot Transmit

1. Check the XMITOK command – it must be ON to allow transmitting.

2. If using a “fixed level” Receive Audio (i.e., the RCV LED stays on all the time) from the radio, which the volume and squelch do not change, set the CD parameter to SOFTWARE.

Cannot Return to Command Mode

The single most common cause of this is that you or a program you have run, have left the MT1200 in a different communication mode such as KISS, LINESUB, TUP, or MODEM mode.

Appendix D: Additional Information

Specifications

Size: 0.95" H x 4.85" W x 3.0" D (2.4 cm H x 12.3 cm W x 7.6 cm D)

Weight: 4.8 oz (0.136 kg)

Power Requirements: 5 V dc to 16 V dc, 12 V nominal

- 35 mA (LEDs on, GPS inactive)
- 65 mA (LEDs on, GPS active, no GPS antenna)
- 75 mA (LEDs on, GPS active, with GPS antenna)

Environmental:

Operating Temperature Range: –30 to +70 ºC.

Operating Humidity: 95 % R.H. non-condensing at +60 ºC.

Power Plug: RIA Connect, RIACON series, type 169, 3 pin (31169103)

Telemetry Plug: RIA Connect, PlugCon series, Type 374, 10 pin (ASP05110)

External Carrier Detect (XCD): Active Low or Active High

PTT and Control Outputs: Open drain, +60 V dc max, 115 mA max

Audio Output:

- Continuously adjustable: 1 mV p-p to 1.7 V p-p
- Output Impedance (ac coupled): 600 Ω

Modulation:

- 1200 bps FSK, half duplex
- BELL 202 (1200 Hz / 2200 Hz)

Audio Input:

- Input Sensitivity: 5 mV p-p
- Dynamic Range: 70 dB
- Input Impedance (unbalanced): 10 kΩ (600 Ω with Jumper J3 connected)
- Max Input Voltage: ±12 V dc; 35 V p-p sinusoidal

Modes of Operation - Packet, KISS, XKISS, LINESUB, MODEM

Other Features: GPS Beacon, Remote Access, and Telemetry

Internal GPS Module-Performance:

General: Trimble LASSEN IQ, L1 (1575.42 MHz) frequency, C/A code, 12-channel, continuous tracking receiver.

Update interval: 1 Hz.

Accuracy: Horizontal: <5 m (50 %), < 8 m (90 %)

Altitude: <10 m (50 %), < 16 m (90 %)

Velocity: 0.06 m/s

PPS (static): ±50 ns

Acquisition: (Autonomous Operation in Standard Sensitivity Mode)

Reacquisition: < 2 s (90 %)

Hot Start: <10 s (50 %), <13 s (90 %)

Warm Start: <38 s (50 %), <42 s (90%)

Cold Start: <50 s (50 %), <84 s (90 %)

Operational (COCOM) Limits:

Altitude: 18,000 m.

Velocity: 515 m/s.

Note: either limit may be exceeded, but not both.

Cold start requires no initialization. Warm start implies last position, time, and almanac are saved by backup power. Hot start implies ephemeris also saved.

Messages from the MT1200

The following are brief explanations of the most important messages that may be sent by your TNC.

Note: Since these messages are also sent by other Kantronics TNCs, they refer to "TNC", not to "MT1200".

*****(callsign) busy**

The packet station you were attempting to connect to (callsign) is unable to accept connects, and responded with a busy signal.

Already connected

You are attempting to connect to someone when a connection currently exists. The STATUS command will show you who you are connected to.

CALIBRATE MODE:
M send mark
R receive
S send space
T send square wave
– or + adjust XMITLVL while transmitting
X exit

This message appears on your screen when you enter the Calibrate Mode. It prompts you to press M to generate a MARK tone, R to receive a Kantronics Calibrate signal, S to generate a SPACE tone, T to transmit a Kantronics Calibrate signal, – or + to adjust XMITLVL while transmitting, or X to return to the Command Mode.

Can't DISCONNECT

You are not connected, so therefore you cannot disconnect. This message will be followed by a "Link state is:" message that is described later in this section.

Can't RECONNECT

You have attempted to reconnect to a station (by issuing a CONNECT command) but the callsign you entered is not the same as the station you are already connected to. You may only reconnect (possibly via a different path) to the station to which you are currently connected.

cmd:

This is the Command Mode's prompt for input. Any characters entered after the TNC prints "cmd:" will be used as command input and not packet data.

***** CONNECTED to call [VIA digi1....digi8]**

A packet connection has taken place. This can happen by you issuing a connect request or a connect request coming in from a remote station. “call” will be the callsign entered in the remote stations MYCALL and if a path was used it will be shown.

***** DISCONNECTED**

The packet connection no longer exists.

EH?

This is the TNC’s generalized “I don’t understand” message. A dollar sign ($) is used to point to the offending character. It will also appear if a required input item is missing, e.g.:

```
C  KCØKON  V
                $
EH?
```

In this example, the required callsign after the VIA option is missing. Most commands that receive an EH? error are ignored. In a few cases, part of the command may be accepted and acted upon, as described under the message “Input ignored”.

ENTER YOUR CALLSIGN=>

Type in your callsign. The TNC needs to know who you are to properly implement its protocol. Your callsign will be placed in the MYCALL parameter and used to generate the CWIDTEXT.

Erase user parameters? (Y/N)

During the self-test, entering Y in response to the this question will clear all changes you have made to the parameter settings.

FREE BYTES xxxx

This message indicates how many additional characters may be entered into the TNC packet buffer before the buffer is full.

*****FRMR received:**

A frame reject packet has been received for an unknown reason. The information field of this packet will display in hexadecimal value. This display may be useful in determining why the receiving station rejected your packet.

*****FRMR sent:**

Frame reject packet has been sent due to a detected error in protocol. Three bytes (6 hexadecimal characters) are displayed to assist in determining the reason for the reject.

Input ignored

Since the TNC command interpreter was kept small and simple, sometimes it will change parameters before it completes parsing some of the more involved commands. In some cases, options at the beginning of the command will have

been acted on before a syntax error near the end of the line is reached. When this occurs, “Input ignored” is used to show what part of the line was ignored. The dollar sign points to the boundary: characters to the left were used; the character pointed to and those to the right were not, i.e., the line was parsed as if a <CR> was entered at the $. For example:

```
BUDLIST QST,KBØNYK NØKN
                    $
Input ignored
```

Because the comma is missing, the command is interpreted as if it were BUDLIST QST,KBØNYK; the NØKN callsign is ignored.

```
KANTRONICS MT1200 VERSION 1.07064
SERIAL NUMBER  xxxxxxxxxx
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cmd:
```

A message such as this (different for each product, but with this format) appears when the TNC is first turned on and after any soft reset, including changing the MYREMOTE commands, or issuing the RESET command.

Link state is:

This message is output in response to the CONNECT and DISCONNECT commands if the state of the link does not permit the requested action. It is prefaced by “Can’t CONNECT” or “Can’t DISCONNECT” as appropriate and will be followed by the current link state. A CONNECT command with no options will display the current link state.

Current link states are:

Both devices busy

Both TNCs involved in the connection are unable to accept any more data.

CONNECTED to (callsign v path)

Your TNC is currently connected to the indicated station, using the path given.

CONNECT in progress

Your TNC is attempting to establish a connection.

Device busy

Your TNC is unable to accept any more data from the remote station at this time.

DISC in progress

Your TNC is attempting to disconnect from another station.

DISCONNECTED

No connection exists.

FRMR in progress

Your TNC has detected an error in the protocol. This is normally caused by two TNCs using the same callsign, resulting in both of them trying to respond to the same message.

Remote device busy

The remote TNC is unable to receive any more data from the radio at this time.

Waiting ACK and device busy

Your TNC has sent a packet to another station and is waiting for the acknowledgment, but your TNC is not able to accept any data from the radio at this time.

Waiting ACK and remote busy

Your TNC has sent a packet to another station and is waiting for the acknowledgment, and the remote TNC is not able to accept any data from the radio at this time.

Waiting ACK and both devices busy

Your TNC has sent a packet to another station and is waiting for the acknowledgment, but neither your TNC nor the other station's TNC is able to accept any data from the radio at this time.

Waiting acknowledgment

You have sent a packet of data to another station, and your TNC is waiting for the acknowledgment.

Not while connected

Some parameters cannot be changed if the TNC is in connected state with another station. This message is printed if an attempt is made.

PRESS (*) TO SET BAUD

You need to press the asterisk (*) key on your keyboard within 2 s of seeing this message. The MT1200' autobaud routine will then detect what baud your computer is using, so the two devices can communicate.

*****retry count exceeded**
***** DISCONNECTED**

The number of tries set by the RETRY command has been exceeded. Therefore the connection has been broken.

Turn unit off and remove jumper

This message appears at the end of the self-test routne.

Value out of range

If the syntax of the command is legal, but the value specified is too large or too small for this command, the value out of range message is returned. A $ is used to point to the bad value.

was

Whenever one of the parameters is changed, the previous value is usually displayed.

Example:

at the cmd: enter;

AX25 OFF

the response will be;

AX25L2V2 was ON

ASCII Chart

Ctrl	Dec	Hex	Code	Dec	Hex	Code	Dec	Hex	Code	Dec	Hex	Code
@	0	00	NUL	32	20	SP	64	40	@	96	60	`
A	1	01	SOH	33	21	!	65	41	A	97	61	a
B	2	02	STX	34	22	“	66	42	B	98	62	b
C	3	03	ETX	35	23	#	67	43	C	99	63	c
D	4	04	EOT	36	24	$	68	44	D	100	64	d
E	5	05	ENQ	37	25	%	69	45	E	101	65	e
F	6	06	ACK	38	26	&	70	46	F	102	66	f
G	7	07	BEL	39	27	‘	71	47	G	103	67	g
H	8	08	BS	40	28	(	72	48	H	104	68	h
I	9	09	HT	41	29	)	73	49	I	105	69	i
J	10	0A	LF	42	2A	*	74	4A	J	106	6A	j
K	11	0B	VT	43	2B	+	75	4B	K	107	6B	k
L	12	0C	FF	44	2C	,	76	4C	L	108	6C	l
M	13	0D	CR	45	2D	-	77	4D	M	109	6D	m
N	14	0E	SO	46	2E	.	78	4E	N	110	6E	n
O	15	0F	SI	47	2F	/	79	4F	O	111	6F	o
P	16	10	DLE	48	30	0	80	50	P	112	70	p
Q	17	11	DC1	49	31	1	81	51	Q	113	71	q
R	18	12	DC2	50	32	2	82	52	R	114	72	r
S	19	13	DC3	51	33	3	83	53	S	115	73	s
T	20	14	DC4	52	34	4	84	54	T	116	74	t
U	21	15	NAK	53	35	5	85	55	U	117	75	u
V	22	16	SYN	54	36	6	86	56	V	118	76	v
W	23	17	ETB	55	37	7	87	57	W	119	77	w
X	24	18	CAN	56	38	8	88	58	X	120	78	x
Y	25	19	EM	57	39	9	89	59	Y	121	79	y
Z	26	1A	SUB	58	3A	:	90	5A	Z	122	7A	z
[	27	1B	ESC	59	3B	;	91	5B	[	123	7B	{
\	28	1C	FS	60	3C	<	92	5C	\	124	7C	|
]	29	1D	GS	61	3D	=	93	5D	]	125	7D	}
^	30	1E	RS	62	3E	>	94	5E	^	126	7E	~
_	31	1F	US	63	3F	?	95	5F	_	127	7F	DEL

MT1200 Parts List

REF DES	DESCRIPTION	Kantronics PN
A1	MT1200 CCA W/GPS	001-0021-01
A1	MT1220 CCA W/O GPS	001-0021-02
A1AR1	QUAD OP AMP, MC33204DG	008-6001-6
A1AR2	DUAL OP AMP, MC33202DG	008-6003
A1C1,2,7,11, 16,17,27, 29-32,41, 42-45,50-52	CAP, 0.1 µF 10 % X7R 16 V, 0603	109-1104-16
A1C3,4	CAP, 18 pF 5 % C0G 50 V	108-1180-6
A1C5	CAP, 100 pF 5 % NP0 50 V 0603	109-0101-50
A1C6	CAP, 10 pF 5 % NP0 50 V 0603	109-0100-50
A1C8	CAP, 0.01 µF 10 % X7R 50 V, 0603	109-1103-50
A1C9	CAP, 0.0022 µF 10 % X7R 50 V, 0603	109-1222-50
A1C10,15,18, 19-22,25, 33-40,46,47	CAP, 0.001 µF 10 % X7R 50 V, 0603	109-1102-50
A1C12,13	CAP, 180 pF 5 % NP0 50 V 0603	109-0181-50
A1C14,24,28	CAP, 1 µF 10 % X5R 16 V	108-2105-6
A1C23	CAP, 10 µF 10 % 35 V Tant	094-0106-35
A1C26	CAP, 15 µF 10 % 16 V Tant	094-0156-16
A1C48,49	N/I 109-	
A1D1-8	DIODE, BAS16	006-1004-6
A1DS3,6	LED, RED RA SMD	006-5005
A1DS1,2,4,5,7	LED, GREEN RA SMD	006-5006
A1E1-31	FERRITE BEAD, 0603	024-1013
A1J1,2,3,9	2-Pin Header	030-2001
A1J4	3-Pin Header	030-2002
A1J5	DSUB 9 FEMALE SMT	
A1J6	CONN, 10-POLE	030-4021
A1J7	Header, 3-pole RA, enclosed	030-4004
A1J8	DSUB 9 FEMALE SMT	
A1L1	IND, 10 µH ±10 % SMD	019-1001
A1P1-5	2-POS JUMPER PLUG	030-2000
A1Q1,2,3	2N7002LT1 N-Channel MOSFET	006-1010
A1R1-4,14-18	RES, 100 kΩ 5 % 200 PPM 1/10 W	132-0104
A1R5	RES, 220 kΩ 5 % 200 PPM 1/10 W	132-0224
A1R6	RES, 47 kΩ 5 % 200 ppm 1/10 W	132-0473
A1R7,12	RES, 620 Ω 5 % 200 PPM 1/10 W	132-0621
A1R8,24,29, 30-32,41-43	RES, 10 kΩ 5 % 200 PPM 1/10 W	132-0103
A1R9	RES, 82 kΩ 5 % 200 PPM 1/10 W	132-0823
A1R10	RES, 150 kΩ 5 % 200 PPM 1/10 W	132-0154
A1R11	RES, 9.1 kΩ 5 % 200 PPM 1/10 W	132-0912
A1R13	RES, 4.7 kΩ 5 % 200 ppm 1/10 W	132-0472
A1R19-23,39,40	RES, 270 Ω 5 % 200 PPM 1/10 W	132-0271
A1R25,34,36	RES, 470 kΩ 5 % 200 PPM 1/10 W	132-0474
A1R26,33,35	RES, 68 kΩ 5 % 200 PPM 1/10 W	132-0683
A1R37	N/I	
A1R38	N/I	
A1R27	0 ohm (GPS delete option)	
A1RV1-5	Transient voltage suppressor	007-7006
A1S1	SWITCH, SPDT SMT,	034-0001
A1U0	PCB, MT1200	009-0021-01
A1U1	DIGITAL POTS, AD5162BRM10	007-8031
A1U2	Modem MX614DW	008-MX614-6
A1U3	SN74LV14	008-74LV14-6
A1U4	FLASH EEPROM, AT45DB041B	007-3003
A1U5	UP MC9S08GB60, 64LQFP	007-6006
A1U6,9-11	Photocoupler, TLP181 4-pin	008-6002-6
A1U7	Temp sensor, TC1047AVNB	007-7008
A1U8	RS232 I/O, SP3238EEY-L	008-1002
A1U12	MIC2026-1BM	005-9100
A1Y1	XTAL, 3.579545 MHz SMT	015-3007-6
A1Y2	N/I	
A1VR1	MIC29201-3.3WU	005-9020
P1	Power Plug, RIACON 31169103	030-4003
A2	radio port cable kit	150-6001

Note: the following parts added when GPS included.

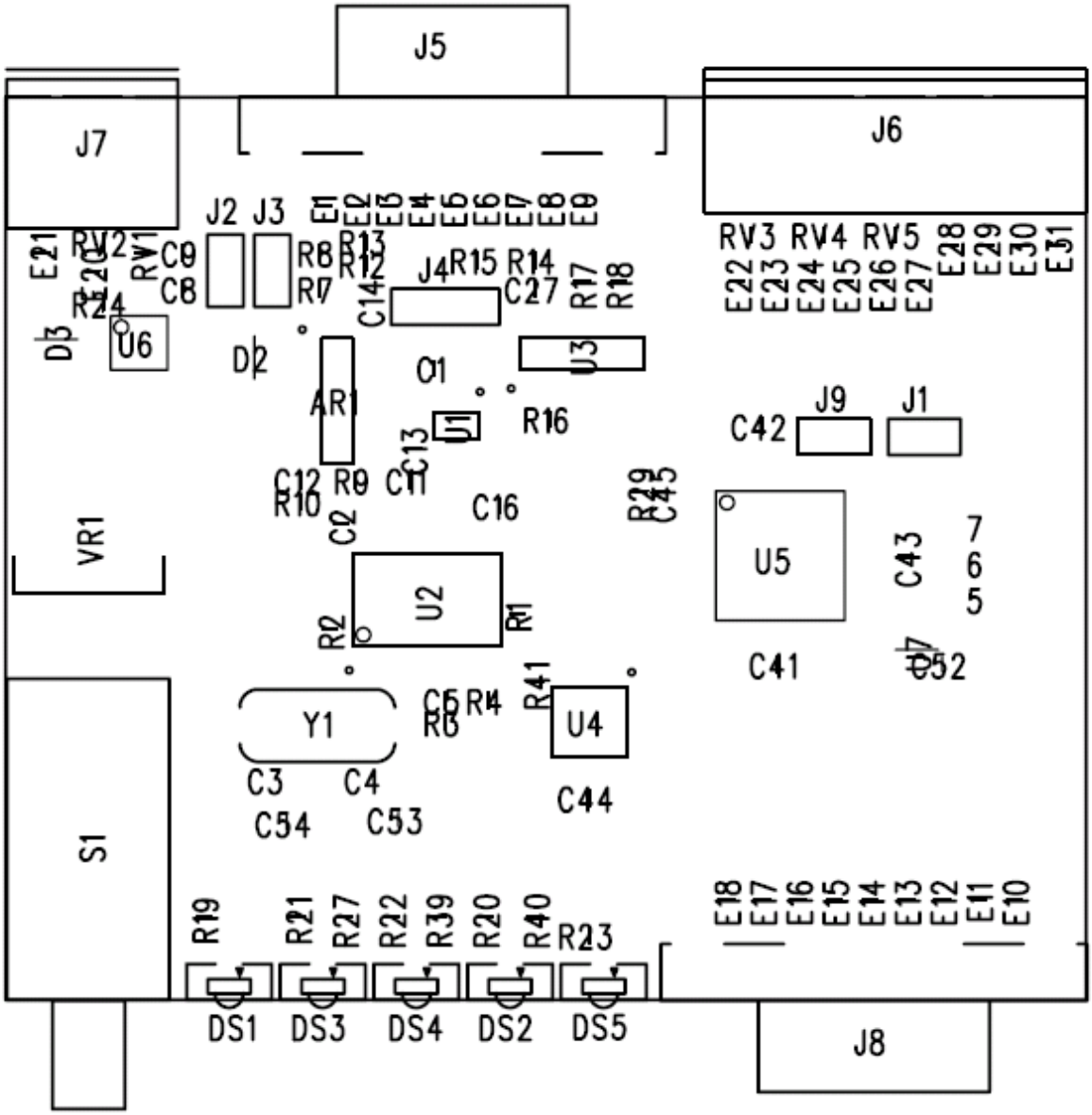
A1C53,54	CAP, 0.1 µF 10 % X7R 16 V, 0603	109-1104-16
A1RE1	GPS RCVR, 12-channel (Lassen IQ)	190-1005
A1R27	N/I	
A1XRE1	GPS Socket	030-5002
A1W1	RF cable ASSY, MCX to H.FL	150-1010
E1	COMPACT MAGNETIC GPS ANT.	190-1004

Note: the Telemetry plug is not included in the MT1200 package. It must be ordered separately.

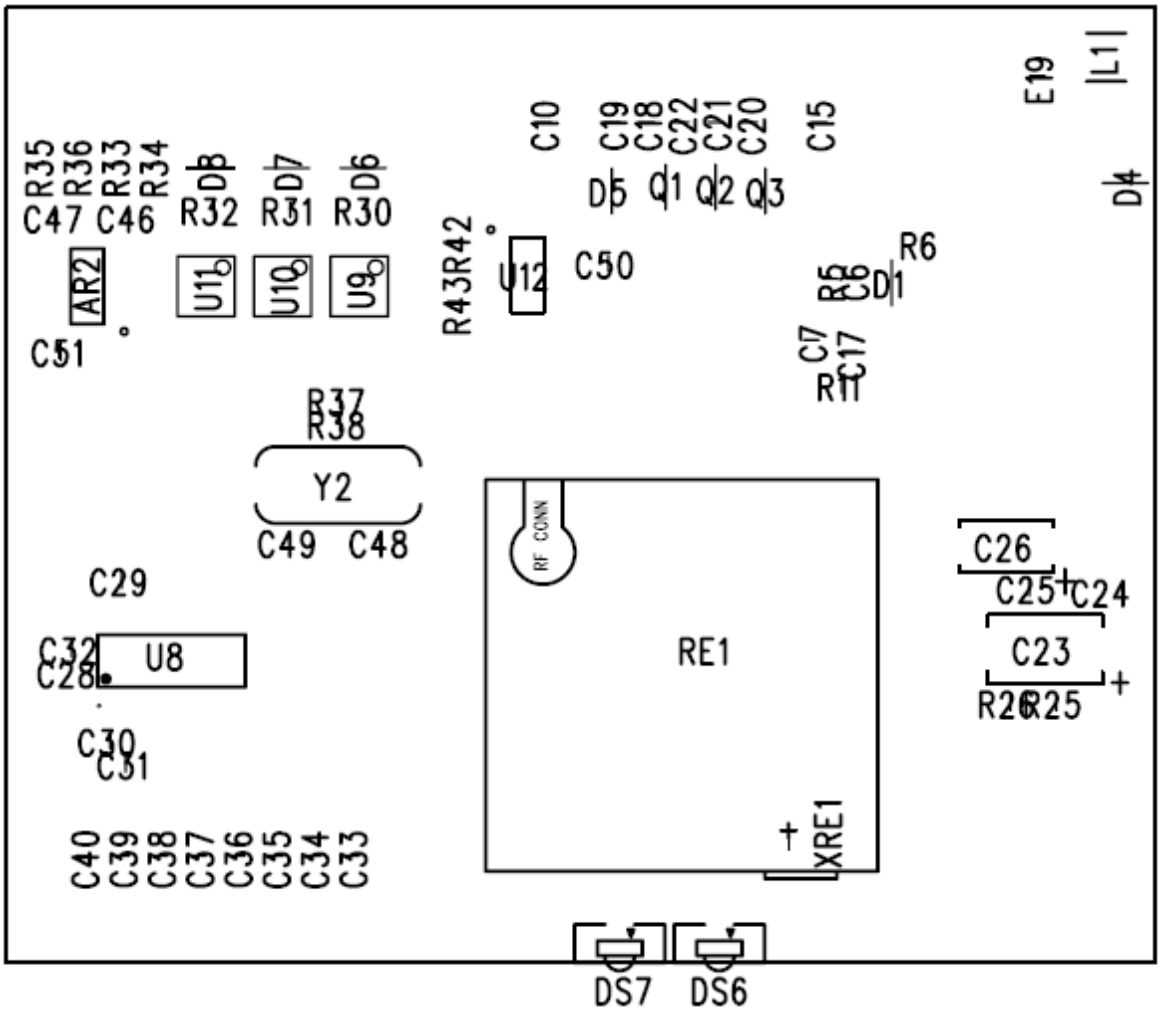
P2	Telemetry Plug, RIA Con. ASP05110	030-4022

MT1200 Parts Layout

Top side



Bottom side


R35
R36
R33
R34
C47
C46
R32
R31
R30
C10
C19
C18
C22
C21
C20
C15
E19
L1
D4
D5
Q1
Q2
Q3
R6
R5
C6
D1
C7
C17
R4
AR2
U11
U10
U9
R43
R42
U12
C50
C51
R37
R38
Y2
C49
C48
RF CONN
RE1
C26
C25
C24
C23
R26
R25
C29
C32
C28
U8
C30
C31
C40
C39
C38
C37
C36
C35
C34
C33
XRE1
DS7
DS6